CARTER'S GENERAL PATHOLOGY.

LIBRARY OF CONGRESS.

Chap. RB 19 Copyright No.

Shelf C33
1891

UNITED STATES OF AMERICA.

A TREATISE

— ON —

GENERAL PATHOLOGY,

AND ITS RELATION TO

Practical Medicine.

— BY —

CHARLES L. CARTER, M. D.,

HONORARY MEMBER OF THE ST. LOUIS MEDICAL SOCIETY; LATELY SURGEON IN THE UNITED STATES ARMY.

SECOND EDITION—REVISED.

24074W

ST. LOUIS:
WOODWARD & TIERNAN PRINTING CO., 309-319 NORTH THIRD STREET.
1891.

RB119
C23
1891

Entered according to Act of Congress, in the year 1891, by

CHARLES L. CARTER, M. D.,

In the office of the Librarian of Congress, at Washington.

H.S.P. Purchased 1948

TO THE

FACULTY AND ALUMNI OF HIS ALMA MATER,

THE ST. LOUIS MEDICAL COLLEGE,

AS A TRIBUTE OF LASTING RESPECT AND FRATERNAL REGARD,

THIS BOOK IS DEDICATED BY

The Author

INDEX.

ADDRESS.

THE PERSISTENCE OF ERROR 11

CHAPTER I.

RELATIVE VIEW OF ORGANIC AND INORGANIC MATTER 17

CHAPTER II.

CONDITIONS OF FORM AND ACTIVITY OF MATTER 24

CHAPTER III.

COMPARATIVE VIEW OF PHYSIOLOGY AND PATHOLOGY 34

CHAPTER IV.

ETIOLOGY—THE CAUSES OF DISEASE 44

CHAPTER V.

ELEMENTS OF DISEASE 58

CHAPTER VI.

QUANTITATIVE CHANGES OF THE BLOOD AND THEIR RESULTS 67

CHAPTER VII.

ACTIVE CONGESTION—RESULTS—REMEDIES 83

CHAPTER VIII.

PATHOLOGICAL CHANGES IN THE PROXIMATE PRINCIPLES OF THE BLOOD 96

CHAPTER IX.

THE IDIOPATHIC, OR ESSENTIAL FEVERS 111

CHAPTER X.

TETANUS, GANGRENE, AND SYPHILIS 134

CHAPTER XI.

SEMEIOLOGY AND DIAGNOSIS—PROGNOSIS 141

CHAPTER XII.

GENERAL THERAPEUTICS 150

PREFACE TO FIRST EDITION.

The science of Pathology, by the combined effort and continued research of its votaries, has emerged from the clouds of Hypothesis which enveloped it in embryo; but this advancement has not produced a corresponding reformation in the Practice of Medicine. Why is this? Pathology has been cultivated by comparatively few in the Profession. Too many plod their way in unwarrantable routine, or in the sin of Empiricism. By such, the development, changes, and career of the human organism, if at all observed, are viewed as the vagaries of Hypothesis, or referred to the absurd agency of Chance.

The design of this work is to present the outlines of General Pathology in its present advanced position as a Science, and its instructive bearing upon Practical Medicine.

I have designed brevity and perspicuity of language in the work, which is written *currente calamo*, expressing my own views in my own manner; though, on some points of the subjects embraced, I have been materially aided by recent and eminent authorities. I have written almost the entire work in the present year, during the intervals of leisure afforded by an extensive practice. This may suffice

if an apology for the style of the work be deemed necessary; but for the principles advocated, no apology is offered nor indulgence asked.

I shall be the recipient of the most desired remuneration, and shall have attained my highest aim, if this Volume contribute, in any degree, to the amelioration of human suffering, and the promotion of the Profession to which I am ardently devoted. C. L. C.

December, 1866.

PREFACE.

SECOND EDITION, REVISED.

Pathology is to many physicians obscure; to me interesting; to our profession important; to our race beneficent.

After years of ardent study, careful investigation and active practice, I present this treatise to the profession as a venture, as it is written from a standpoint totally independent of the censorship of creeds, schools and traditions. It is a source of gratification that this humble essay has been approved by many profound thinkers and some leading schools.

The first edition, 2,500 volumes, having been exhausted, the demand for the book calls for a second edition.

The work has been carefully revised, new matter added, and is again offered to the profession as a concise treatise on general Pathology.

El Dorado Springs, Mo., June, 1891.

THE PERSISTENCE OF ERROR.*

Mr. President and Doctors:—I am not here to disparage you with unfriendly criticism nor to regale you with flattering unction. We are all here to work by the rule of addition—to cast together all we think we know, then eliminate all we do not know—what remains is the known quantity. Should this appear infinitesimal, it may be augmented and potentialized by this coming together.

Our profession demands the aid of the iconoclast. Into every field of thought error obtrudes with alluring blandishments. In the religious, error most abounds, and longest persists. The reason of this is obvious; theology rests upon the fiat of deduction, rather than the scrutiny of induction. The religions are not beautiful systems of morals, veiled in allegory and illustrated by symbols, but antiquated traditions, founded on superstitions and enforced by dogmas; their creeds claim for their codes divine sanction, and submissive faith without investigative reason marks the highest attainment of their votaries. No wonder, then, that in these, error does much abound.

With these prelusory remarks, let us now consider the profession of medicine in which I am sure we are all profoundly interested. In this we deal mainly with inductive reason, and in this, great minds have labored, great advances have been made, and great blessings have come to mankind. Our triumphs are too glorious for oblivion and too numerous to mention now. But this is our bright side.

* An address delivered before the Tri-county Medical Association, at Butler, Mo., by the Author.

We must confess some errors, and these we may profitably discuss here and now. We are not to consider the long list of absurd superstitions, never sanctioned by the profession, but believed by some people; as carrying a potato in the pocket for rheumatism—or buckeye for piles, a comb in the bosom for mammary abscess, and so on almost *ad infinitum*. But I wish to notice some of the errors which the profession has indorsed, and even now practice. It is not wonderful that the profession has at times gone dashingly into error, for that is human; but the strange thing is that wrong principles and practice on some things have so long persisted. Hippocrates taught that amputation could only be safely performed through dead tissues, and that notion prevailed and governed the practice of surgery for two thousand years, till the time of Paré. Insane and epileptic people were as long believed to be possessed of a devil till the time of Pinel. Doctors persistently believed that the arteries contained air for more than fifteen hundred years. The lamented Servetus, who was burned at Geneva as a heretic in 1553, was the first to trace the circulation of the blood from the heart to the lungs and back to the heart. To suppress science, Dr. Michael Servetus was burned, and all of his writings except two volumes.

Down to a time within the memory of some of you, and when I began the practice of medicine, thirty-three years ago, mercurial salivation and heroic blood-letting were endorsed as orthodox treatment in most forms of disease—then it was as usual for a doctor to carry a lance as it is now to carry a thermometer; the former has long been laid aside, and the latter must be relegated to the hand of the quack! Then fever patients were not permitted to taste cold water, the prescribed drink was tepid water, in which was the ubiquitous burnt crust—then ptyalism played havoc with multiplied thousands of confiding patients, especially in syphilis, and the ravages of mercury were thought to be the ravages of syphilis—and were worse.

The long use of the stethoscope is another example of the persistence of error. For forty years the medical profession, from the learned professor to the mere tyro and the cheeky charlatan, deftly plied that instrument and looked profoundly wise. Even as late as two years ago I saw the late Dr. Flint go through the delusive farce of using the stethoscope, pleximeter and mallet, in the presence of 500 doctors and medical students in Bellevue. Perhaps dotage and puerile love of show form his best apology, but I was impressed with the fact that the Flint practice, like the flint lock, has had its day, for the profession has finally stamped out, lived down and risen above these imposing delusions.

Old Sam. Thompson said, "Heat is life, and cold is death." In this the venerable steam doctor was about right. More recently, but with less genius, many doctors, especially juveniles in practice and drones in pathology, have become morbidly afraid their patients will get too warm. This heat craze has impregnated clinical medicine with bastard twins —the clinical thermometer and cold baths in typhoid fever. Tepid baths impregnated with salt and soap *are* indispensable in the treatment of the low grades of fever, but the immersion of such patients in cold water too often proved fatal, consequently one of the twins died, but the other is still dragging out an unprofitable existence, and is the *vade mecum* of various grades of doctors, including professors, novices and mountebanks. In their hands that little guessing tube is as the cane in the hand of the dude, the divining rod in the hand of the water-witch, or the wand in the hand of the magician. They insert the little tube into the mouth or axilla of their patient (of a horse would do as well), let it remain awhile; *ad interim*, they assume an air of deep solemnity and amazing profundity. Then they take it out, examine it carefully, and *guess* how their patient is getting along. Wonder how long this delusion will persist! Not always, nor long, for the people will soon come to look upon the tube as an emblem of weakness. Besides, I have great

confidence in the conscientiousness, the learning and the honor of the better class of the profession.

A real doctor should be void of shams; should be able to apply ripe culture and clinical experience to determine the conditions and indications presented by the tongue, pulse, skin and many other such reliable avenues to verity and success.

Typhoid is a continued fever depending upon essential morbid elements in the blood, and is of low but varying grades. Do not err by calling each grade a kind. In the old or long settled portions of this country, fever is generally of a low grade, or typhoid type. Our old-fashioned bilious fever is passing—indeed, has passed—into typhoid. I have seen individual cases do this, but the general and gradual transition has kept pace with the plow until now typhoid is the prevailing type of fever. The disease is congestive, the temperature variable, warmth and coolness local and alternating, hence, thermal test impossible and absurd. The patient is better warm than cold.

The schools evidently err in plunging patients affected with sun-stroke or heat-stroke into cold baths or ice boxes. They would do better to immerse the body in tepid water, and apply ice to the head.

Another error is the prescribing of cod liver oil in phthisis. It is worse than worthless; it would blunt the appetite and derange the stomach of a buzzard, and has hurried many patients to the grave. The new and novel, yea, ludicrous and futile mode of treating phthisis by inflating the bowels with sulphuretted hydrogen and carbonic acid gasses, is offensively absurd. If the first mentioned gas were curative, the flatus of that gas which is generated in the bowels and is very abundant in consumptives would work a natural cure. Humanity demands that doctors intent on display should be merciful and not stink their patients to death. Observation and experiments are the progenitors and promoters of science, but the essential element is truth, or verification.

M. Pasteur's inoculations for the prevention and cures of hydrophobia unfortunately failed to develop a fact or elucidate a truth; the practice is now known to rest upon an error, and the Austrian hospital directors, after numerous experiments at Vienna, have suppressed such inoculations.

These are not all, but why do such errors persist from day to day, from year to year, and from generation to generation? Too many are graduated into the profession without the requisite literary qualifications and peculiar intellectual endowments necessary to make doctors; too many medical schools are in operation; too many men are filling professors' chairs and conducting clinics, who are too illiterate and uncultured in general science to grapple with abstruse problems, differentiate clearly, or reason profoundly; too many in such positions, especially in New York, are too young and inexperienced for teachers. I saw a professor in one of the New York clinics examine a child six weeks old and pronounced the disease incurable paralysis, caused by pressure of the brain during parturition. I privately suggested to the professor that the child's arm was luxated at the shoulder, and that proved to be all that was the matter. That professor is a specialist "good on the brain," in New York, too, the assumed Bag-Dad of medical learning; hence, doctors are not to be weighed according to the size of the town in which they reside, nor even by their position; neither should verbose pomposity nor its equivalent dullness be taken for dignity nor wisdom. Unwarrantable assumption, incapacity to investigate, a desire to ape others, or greed of gain, too often mar our profession. We want more men in medicine, in religion and in politics, who have the brains to think and the bravery to tell the truth, whether it makes them heretics or heroes, martyrs or monarchs.

A TREATISE ON

GENERAL PATHOLOGY.

CHAPTER I.

RELATIVE VIEW OF ORGANIC AND INORGANIC MATTER.

The primitive and ultimate state of all matter is inorganic. Hence, the earth is the prolific mother of the countless myriads of living organisms that dot her broad periphery. Millions of human beings bask in her genial climes, and luxuriate in the variety and abundance of her productions—countless tribes of animals subsist upon her bounties, and traverse her ample domain—numerous nations of plants rise from her bosom, extend their stately boughs, and unfurl their tender leaflets to the gentle zephyrs, to furnish oxygen and food for their superiors in organization. Yet, each of these living organisms is composed of the material that constitutes the rivers and mountains. Each one is formed a model of its kind; endowed with properties of matter and conditions of activity, and regulated by laws instituted by the Creator of the Universe. Each is as a parasite receiving directly or indirectly from the earth the supplies necessary for an ephemeral existence. Finally, each is perishable, and soon returns to the earth to form the inertia of the inorganic world. So that, physically, the intellectual man, the beautiful woman, the fleet antelope, the sly mouse, the stately

oak, and the humble lichen, are alike formed of the earth's material—are alike pensioners upon her bounties—alike they have a common fate, dissolution—alike their elements are returned to the silent recesses of the inorganic world.

We may extend this general view of organic life by presenting other interesting similitudes common to all living beings. Each individual organism, whether animal or vegetable, is derived from a primordial cell, which consists of a vesicle filled with nutritive fluid; each is developed by nutrition, which is at first carried on in the single primitive organic cell; this cell produces its kind, and multiplies into successive congeries of cells, until an organism is formed. Each organism is supplied with a circulating nutritive fluid; hence, the sap of plants and the white fluid of the mollusk answer to the red blood that nourishes man and the lower animals.

This general resemblance is again presented in the remarkable similitude between the life of an individual organism and the life of a species. Each species, as well as each individual, has its time of origin, its embryonic stage, and its time of decline. Some of the fossil forms of the early geological ages are the embryos of existing species of animals.

Leaving this general view of the resemblance between, and the characteristics common to all living organisms, organic life next presents to our view a series of individual beings, each possessing its own peculiar individuality, properties of matter, and conditions of activity. The organic series appears to arise from inorganic matter, as by natural proneness, and extends from the merest effort at organization to an organism most complete and wonderful—from the cryptogamia to the mammalia—from the mushroom to the man—from the humblest moss to the most highly organized man.

Organization is not limited in development by the arbitrary classification of species. The classification of organic

bodies into species, is convenient as expressing a general idea of their degree of organization, but it is far from definitive. It is a common error to suppose that all of any species of plants or animals are equal in organization. There are various degrees of organization in the human species; and so of all the species of the lower animals and plants.

Perhaps the most comprehensive view of the organic series is presented by supposing a ladder planted at the foot of Chimborazo and extending to the summit; this may be made a scale representing the relative organization of all organic bodies. Commencing where life and matter meet, in the primordial cell of the cryptogamic plant, at the lowest round of the ladder, we ascend gradually through the vegetable kingdom, and its various botanical classifications, until we reach the zoöphyte, which is the link that connects vegetable with animal organization. It is the round upon which the former ends and the latter begins.

Leaving these zoöphytic corals and polyps, we continue the ascent through the zoölogical classifications of the animal kingdom. Here we find, successively, the mollusca, the articulata, and the mammalia. The highest species of the latter order are the human races; of these there are five. These races rise successively one above another, in point of organization, as species above species, the lowest but a little above the highest of the lower animals—the highest being, as a class, the most completely developed of all organic beings. It is important to observe the effect upon organic development of external influences, such as light, heat, mental impressions, etc. These influences will be considered in the succeeding chapter.

It is an important fact that every primordial cell presents the same precise appearance, whether animal or vegetable. If three of these cells be examined by the most experienced observer, no perceptible difference can be distinguished between them; each will be a fac simile of the others. Yet, the results of their several developments may be far different—

one may develop a man, another a frog, and the other a fig-tree. Thus, by a few variations in the creation and development of a diminutive cell, the living being is a reptile or a fowl, a plant or a lion, a leviathan or a man.

The primordial cell, then, is the point from which all living beings spring; it is the point at which life and matter meet and are united—at which vegetable and animal life meet and embrace each other in the harmony of progressive development. It is the germ that gives life, form and activity to the organic universe—that models every creature after its kind—that gives hugeness to the elephant, fleetness to the reindeer, strength to the horse, eyes to the eagle, wings to the dove—that gives a limited degree of reason (not instinct) to the lower animals—that links man to all below him—that clothes him in the image of the beneficent Maker—endows him with the highest degree of reason—prepares him for the highest order of life.

The primal cell was doubtless formed from inorganic material; but how was it thus formed? Need we invoke the God of nature for a solution of this query? Manifestly, inexorable law exemplifies nature, and no known power can change the laws of matter. Organic cells produce their kind; the form and nature of an organism is impressed upon the primordial cell by the power that produces it. These cells are eminently prolific; a single cell develops congeries in rapid succession, until an organism is formed. The resulting organism is indicated by the nature of the first cell and the influences attending its development. Each living being, from the humblest plant to the most complex human being, has its precise place in the universe established by these influences. Nature never makes a mistake—no *lapsus naturæ* can occur; every development depends on the influencing circumstances. Hence, a child may be born with hare-lip, minus a limb, or it may be acephalous; it would truly be an unnatural child, but its development in this form is a natural result of the attendant

influences. Nature "cuts no freaks," and is not at fault for these imperfect developments; they are but evidences that the operations of nature are conducted upon a general plan —that development is liable to mutation from ever-varying circumstances. Development, like, nutrition, may be increased, diminished, or perverted.

Observe the rudimentary organs, in some animals, as the subcutaneous feet of some reptiles. Plants, too, present rudimentary organs and excess of development; a flower is a transformed branch—the sepal, the petal and the stamen would have been leaves had circumstances been more conducive to their development. These facts present the important corollary that the different forms into which organic matter is grouped is neither the effect of Divine special interference nor the decree of chance, but it is the inevitable consequence of immutable physical law.

A comprehensive view of nature presents all the forms that surround us, both animate and inanimate, the earth, and all the hosts of worlds that circle the sun, as the product of an original idea, and the subjects of one prime law which is co-extensive with space and coëval with the universe. Then it is under these laws that the process of development is conducted; and as it is diminished or perverted by adverse influences, it is promoted when the influences are conducive. Horticulturists promote the growth of plants, and improve the quality of fruits by careful culture. Animal development is augmented in a similar manner. Children inherit the dispositions and infirmities, and, coördinately, the resemblance and intellect, of their parents. A generation born of highly organized and intellectual parents, and brought up in cultivated social circles, would bring the millenium. Vast and wonderful are the capabilities of man. He is the epitome of nature, the acme of the organic universe, the noblest sentient organism. He is a material body, capable of most exalted reason and morals. He exercises an appreciative discrimination between right and wrong, between

good and evil. He possesses a principle—a moral nature—a living monad, which impels him to seek the reward of virtue and to evade the punishment of vice. He is the architect of his own destiny. He posesses power to act and a will to direct his own actions, and he is responsible for the manner in which he does act; but some of his actions are necessitated; for these he is not responsible.

Man's moral nature, exalted as it is, is not his only ennobling attribute; he is capable of a degree of intellection, investigative reason, and methodical thought, which exalt him far above all organic beings. But for these faculties of man, the moral world would be a chaos—the earth would yet wear her primal dress—the ocean would forever defy navigation—our rivers had never been whitened with the sails of commerce—the earth would continue her circuit without her motion being observed or admired—the blood would course our veins, and nutrition and oxygenation would go on without being observed—steam would have forever moved on with, and existed in, the rushing billows—the lightning would have roamed untamed in the elements—the universal law that regulates life and matter, that controls the stars and holds the planets in their orbits, would have continued its ceaseless operations unrecognized and unadmired.

Insignificant indeed would be man without the guidance and power of exalting mind. Muscle is to brain as matter is to mind. Muscular contractions can but procure the daily bread; mental power elevates individuals, communities, and nations. Physical power is brute force; knowledge is power—real, effective, and supreme.

The noblest intellect and the highest virtue are united in man—sentient and moral, intellectual and responsible man. He alone is biped and bimanus. He alone possesses a perfect vertebral column. He alone supplicates the shrine of science—investigates the laws to which he is subject, both physical and mental—moves erect—is lord of earth—having

no peer, he moves the paragon of the organic world. Though he comes into the world the most helpless of all animals, his feeble arm chains the mighty lion; and the horse, the ox, and the elephant, move at his bidding. Armed with the front of Jove, the power of intellect, the light of reason, and the torch of discovery, he scans the universe—makes all below him subservient to his will. He disarms thunder, and sends the lightning on errands, along the wire path. The earth rejoices in his presence, allures his taste with viands, and perfumes him with her fragrance. Morpheus guards his slumbers. Distant worlds send luminous beams to relieve the monotony of his nocturnal soliloquies.

CHAPTER II.

CONDITIONS OF FORM AND ACTIVITY OF MATTER.

Man is not exempt from the laws of matter. It would be inexcusable error to suppose that the form of even inorganic matter is the result of chance. The irregularities of the earth's surface depend upon laws as purely physical as those which hold the planets in their orbits. The mountains' lofty peaks and descending slopes are marked by the ravages of time, and by the physical impress of the number of beating storms they have withstood. The desert of Sahara tells of the burning rays of an equatorial sun—the sands of the beach and the rock of Gibraltar are marked by the ever-recurring ocean wave.

Rising to the organic universe, we find the same inexorable law prevailing throughout; it modifies the form and regulates the activity of all organic bodies. Plants do not spring up indigenously as under the irregularities of Todd's fabled chance world, but their growth and distribution are influenced by light and heat derived from the rays of the sun; also, by the quality of the soil and the amount of carbonic acid gas in the atmosphere. That these influences direct the growth and variety of plants is abundantly demonstrated. If we travel from the equator toward either pole, we find each hemisphere belted with zones precisely corresponding in the nature and variety of their vegetable productions. Corresponding zones of vegetable growth are observed in ascending from the base to the summit of a mountain of sufficient altitude to present the same variations

of temperature and climate as the different latitudes of the earth's surface.

Light, heat and moisture are essential conditions of vegetable growth. A seed would never germinate in the absence of these conditions; but if it be introduced into a soil where there is sufficient warmth and moisture, it will germinate; the young plant, being fed and nurtured by the nutriment stored up in the germinal seed, will rise above the ground before this supply is exhausted, but it cannot long survive without the presence of light; there will be tardy and imperfect development owing to lesion of nutrition; instead of being green the plant will be colorless, in consequence of the absence of chlorophyl, which is imparted to plants only through the agency of light.

Moisture promotes the growth of plants by supplying their roots with carbonic acid gas, which diminishes the amount that the leaves are required to take in from the atmosphere. Rain facilitates the development of plants by allowing them to appropriate to their own tissues the saline constituents of the soil in which they grow.

Besides these physical conditions, it is important to observe the variable influences produced upon plants by the various chemical constituents of the soil. The tobacco-plant requires a large amount of nitrate of potash; the lime-plant requires abundance of lime earth. High dry lands contain largely of oxygen; low damp lands abound in hydrogen and nitrogen; and consequently in ammonia.

From the foregoing considerations, it is conclusive that the various forms of inorganic bodies are directed by the universal law of cause and effect; and that though there exists in the germs from which vegetable organisms spring an inherent predisposition to develop into certain definite forms, yet their activity and degree of development are dependent upon numerous conditions, which are so many operations of physical law; so that vegetable and inorganic forms are alike determined by the binding force of philosophical laws.

Further, what is true of these is also true of the animal organism, including man. Medical men, though leading the way in scientific research, were slow to discover that all matter is governed by one stupendous law. It is in conformance with this law that the universe is governed; that the world "wags" as it does; that material bodies have form, affinity, attraction and gravitation; that organic as well as inorganic bodies possess these properties; that the sap nourishes the tender leaflet; that the blood courses the veins and ramifies the minutest capillaries; that organic activity is maintained at a standard of health; that disease originates and produces death, and that it subsides either with or without the aid of medicine.

It is unfortunate for science that most of the obscure phenomena of organic activity were so long considered as "vital power," which was understood to be the result of divine fate, or the fiat of some god in Pagan mythology.

The animal mechanism now claims our special attention. It is designed for activity on a huge scale, and is constructed in precise adaptation to the nature of the influences that put it in motion and continue its action. Besides, each animal is constructed in perfect adaptation to its mode of life; hence, the fish has fins, the fowl has wings, the ruminant animals are provided with facilities for easy locomotion or transition to enable them to go in search of food. Man is favored above all, with legs to walk, hands to labor, and a brain to exercise a high order of reason. The lower animals, too, are capable of a degree of reason, in direct proportion to the amount and quality of their cerebral matter. That the lower animals possess this capability, has been denied by almost all writers on metaphysics; but it is affirmed by observing the docility of the horse, the dog, and the elephant; and it is asserted by the great fundamental law of cause and effect, of structure and activity, of mind and matter.

All animals live upon a descending scale; their activity necessitates disintegration of their substance; they suffer a

continual retrograde metamorphosis, by which they tend to decay, and return to their inorganic elements. They do not possess the capability of opposing any resistance to this continual wasting, but provision is made to compensate for it by the process of nutrition. The preceding remarks apply alike to all animal organisms, and, in a general sense, to plants as well. From the foregoing are derived the following considerations, which apply in a special sense to the human organism.

We cannot contemplate the wonderful design of the human mechanism without feelings of deepest wonder at its sublimity and excellence, nor without emotions of reverential esteem for the Designer. And when we consider the completeness of this organism—the structure, adaptation and properties of its various parts fitting it for the performance of the various functions—essential not only to its existence and preservation, but to the highest order of life and activity—the wonder becomes amazement. But wonder ceases as Physiology advances. Under the behest of the universal laws of matter, and the properties with which our various tissues and organs are endowed, it is natural for all the functions of life to be carried on as they are in health, and in the presence of their essential conditions of activity; so when any part of its structure suffers lesion, it is natural for the action to be correspondingly changed. The life of the organism depends upon the ceaseless activity of its various parts, especially of the heart, lungs, and brain, which are the tripod of life. The activity of each organ depends upon one or more conditions; thus, the motive power of the heart evidently depends upon the direct presence of oxygenized blood, and the stimulus which it imparts to the minute ganglia of sympathetic nerves. The heart, instead of being the seat of mental emotions, as was once supposed, is a muscle constructed into a hydraulic apparatus. Its left ventricle contracts with a force sufficient to raise a weight of thirteen pounds, and may perform three thousand millions of such

contractions during the life of an individual. The essential condition of the activity of the lungs is a due supply of atmospheric air, which is required for the oxygenation of the blood; and upon this condition of the blood depends all the activity of the brain and nerves, and upon these depend mainly all muscular and glandular action. So that, by an easy transition of methodical thought, I conclude that all organic activity depends essentially upon the quantity and quality of the blood. Besides, certain organs and parts require special external influences to excite their latent functions into activity; thus, the eye perceives nothing in darkness; the optic nerve requires light as an essential condition of its activity. The optical mechanism, and the accessory apparatus of the eye, elicit our admiration of the wisdom and perfection of the design. The retina is formed by an expansion of the distal extremity of the optic nerve. The impression of light is received by it, and by the aid of the black pigment, which serves as a screen, to prevent the rays of light from straying, and by the shade of its color the image is formed. The ciliary muscle adjusts the lens according to the distance at which objects are viewed, by diminishing the convexity of the cornea in proportion as the distance is greater. The iris determines the color of the eye according to the color of the pigment on its posterior surface, but its essential function is to regulate the rays of light that are allowed to pass on to the retina; it is stimulated to contract in direct proportion to the intensity of light, and immediately dilates as the light is removed.

The auditory nerve requires the vibration of sound as a condition of its activity. The mechanism of the ear is well adapted to impart to our senses the vibrations of sound; not only so, but it affords us an accurate idea of external relations by enabling us to distinguish the peculiarities of sound. In order to enable us to discriminate between the different characters of sound, the ear is supplied with a tympanum to determine the intensity, a cochlea to measure the length of

the wave or note, and canals which inform us of the quality of sound. The scalæ are designed to prevent continuous reverberations, by destroying the wave as soon as it has filled its mission; but for their interference, an ordinary vibration of sound would continue to revibrate for an indefinite period of time; besides, every sound of ordinary intensity would, perhaps, do violence to the brain. The great intensity of sound produced by the heavy cannonading in our late war did serious damage to the auditory apparatus and brain of many cannoniers.

The eye and ear, though essential to our convenience and happiness, are not essential to life; but, like them, all organic activity essential to life depends upon conditions. Manifestly, in the construction of man oxygen was designed as the prime and essential condition of his organic activity. The fœtus in utero is supplied with oxygen from the arterial blood of the mother by means of a very curious design in the uterine surface of the placenta. When detached from the mother, it can survive but a few moments upon the small amount of oxygen it receives through the skin; therefore, oxygen is the first thing demanded in its independent life. The external impressions produced by the new world, or by some specially directed agent, upon the peripheral extremity of the excito-motory nerves, cause the lungs to expand and receive oxygen into the blood; and this oxygenized blood supplies the brain, and through it every member of the system with its essential condition of activity.

This subject is eminently suggestive: each idea presents another still more instructive—each successive truth is but the herald of the abounding treasures that invite us onward.

There would be no organic activity without an external primitive agency or influence to awaken it through an essential condition. Activity is conditional—life implies activity; activity implies waste, or death of tissue. Hence, the condition of life is death. Ominous truth, proclaimed by the laws of life, and attested by the laws of matter. Man

is a taper—always forming, always dying. In order to form a just conception of the rapidity of our interstitial death, it is important to observe that for every contraction of the heart about twenty millions of blood-cells die!

The more active an organ, the more rapid its death. When the brain is actively engaged in thought, the waste of its substance is correspondingly increased. Nervous material contains largely of phosphorus; its proportion in the brain is from 8 to 35 parts in 1,000. As the relative proportion of phosphorus in the brain has been observed to increase during adolesence, and to diminish with declining years, it has been supposed that its proportion stands in definite relation to the degree of intellect, and accordingly that 18 parts in 1,000 indicates an average intellect. Doubtless this view should be received with some allowance; yet it is a fact, significantly corroborative, that the brain of idiots contains a very low relative proportion of phosphorus. The phosphorus in the brain is in an unoxydized state, but it is rapidly oxydized by the increased amount of arterial blood distributed to the brain during excessive mental labor; hence, the waste material of the brain is mainly in the form of phosphates, which are excreted by the kidneys and skin.

Muscular activity is attended with excessive waste; great physical exertion is, most of all activity, destructive to tissue. The resulting waste is mainly in the form of urea, which is taken into the torrent of the circulation, and hurried out of the system by both the kidneys and the sudoriparous glands. The fats are exceedingly combustible; after undergoing oxydation they are excreted in the form of carbonic acid gas and water. The waste material of the walls of the capillaries passes from the system through the kidneys in the form of ammonia. When the protean constituents of the food are carried into the blood in greater abundance than is necessary for the growth or repair of the system, the excess is cast out in the form of urea and uric acid. It follows, accordingly,

that adults lose daily about five pounds of tissue by disintegration.

In order to compensate for this continual retrograde metamorphosis, the system must be supplied with oxygen, water, and combustible material. Each of these possess chemical affinities for the others, which give rise to all the physical phenomena of life. Oxygen is everywhere present in the surrounding atmosphere, and is the prime condition of motive power. It is essential to the production of animal heat, and to the combustion of material preparatory to its disintegration.

Water is furnished to the system in great abundance in the food and drink. By its evaporation it becomes a refrigerent, and prevents the continual combustion from generating too great an intensity of heat. Besides, it attenuates the blood, and promotes the absorption and solution of waste materials preparatory to their excretion; and as well, by its solvent power, it presents in a fluid state such nutritive materials as are required for assimilation and repair.

Combustible material is furnished to the system in the form of food. It is essential to man that the food be composed of a mixture of animal and vegetable substances; that it be sufficiently calorifacient to insure the requisite degree of oxydation and heat, and that it be sufficiently histogenetic to furnish to the blood all the materials necessary to build up the decaying tissues.

Then the inorganic world furnishes our food and our material substance, by entering into such combinations and relations as form vegetable and animal substances, and, finally, that of material man. These considerations startle us with a view of our immediate proximity to the inorganic world. Viewed in any direction, but one material meets the eye and bounds the vision—on either hand the fearful precipice presents. We are continually receiving from the inorganic world new supplies of material matter—we are continually dissolving into our inorganic elements.

The blood carries to all parts of the system the plastic material necessary for repair. The assimilation of these plastic elements by the various parts to meet their several demands, in kind and quantity, appears to be influenced by something like elective affinity. A similar affinity is presented in the action of medicines; hence, we have cholagogues, diuretics and hypnotics.

Connected with the reparative process is observed a friendly provision for the transference from one part of the system to another of material necessary to the reconstruction of the part; accordingly, a large amount of phosphate of lime is transferred to every part where ossification and reconstruction of osseous tissues is progressing; by a similar special provision, chloride of soda is transferred from all parts of the system to the vicinity of an inflamed part. In like manner fats are stored away in the system, and held in reserve to meet future demands.

The aggregate amount of ingesta which man receives daily is about one-fourteenth part of the weight of his body. It is estimated that he receives diurnally, of water four pounds, of oxygen two and one-half pounds, and of food two and one-half pounds; so that he consumes annually about a ton and a half of these materials. These, together with a series of ever-varying physical relations and conditions, as light and atmospheric relations, give form and activity to man. As all these conditions of nutrition, development and life vary, so in precise ratio will the resulting form vary; and as the form varies, so will the faculties and mode of action.

To live is to change. Our changes begin with the fecundation of the ovum, and cease when our last corporeal tenement is dissolved. We do not possess the same entire body a moment. We hold our indentity in consequence of continual change of our material substance, which is but a combination of inorganic elements in ceaseless change and rapid transit, and deriving activity from essential relations and conditions. Our changes are directed by our varied relations

to the physical world and by the operations of physical law. Individual peculiarities of type, or the predisposition of a primordial cell to develop into a prescribed definite form, is as subservient to the modifying influences of general laws as are the types of disease to individual peculiarities of constitution. That "circumstances govern cases" is an adage as true as it is antiquated, and it has a special importance when applied to the human organism. A dose of medicine, judiciously prescribed and timely administered, may save life; if injudiciously or untimely, it may produce death. An untimely mess of fried eggs, or cabbage, may produce death as surely and quickly as an overdose of arsenic or strychnine. A morsel of beef taken into the system effects a change, though not perceptible, yet as real as that produced by a grain of morphine.

The careering rain storm and the chilling blast affect, in some degree, all matter within their range. Physical influences produce the cliffs on the western shores of rivers and the low lands on their eastern borders. Excluded from light, a plant can maintain but a brief aërial life, and that under a very imperfect development. In the absence of this one physical agent, a tadpole would never become a frog. An infant exposed to perpetual darkness would be imperfectly developed and short-lived, and would with almost absolute certainty be the subject of imbecility of both body and intellect. The inhabitants of the dark gorges of Switzerland, and the valleys of the Alps, present numerous examples of extreme idiotcy and frightful cretinism.

CHAPTER III.

COMPARATIVE VIEW OF PHYSIOLOGY AND PATHOLOGY.

Man is almost isomeric with the Andes. He is an infinitesimal integer of the material world—an atom of inorganic matter vitalized—and yet, in image, he is the prototype of the Creator. By organization, adaptation, and mechanism, he is a microcosm. He is preëminently endowed with the attributes of sensation, mobility, and intellectuality. His matchless system of organs and their wonderful adaptation endow him with the highest degree of animal organization and adapt him to the highest order of life. Further, each organ and part of this complex organism is assigned definite functions, and all act in harmonious concert according to fixed laws of nature. This is *health.* That science which investigates these laws is called Physiology.

A structure so complex, having so many combinations and peculiar modifications as the human organism, is very liable to suffer lesion in some of its parts. The consequence of this lesion is a corresponding disturbance of the functions of the organ or organs involved. This lesion of the structure, however slight it may be, is *disease;* and the disturbance or change of functions which it produces are *symptoms.* That science which investigates the diseased organism—which enables us to determine the location, character, and cause of the lesion—is called Pathology.

So far we have presented Physiology and Pathology, each in its distinct and legitimate domain, but we often have to deal with both conjointly; they flow together so intimately that it is often difficult to determine whether a given proposition belongs to the province of the one or the other.

Pathology comprehends all there is of Physiology. It is the province of the latter to investigate normal functions; of the former, to investigate abnormal structure and the consequent change of functions. There is no obvious reason for this seemingly arbitrary division of the science which investigates organic life. I maintain that the human organism, with its complex system of organs, is *per se* as automatic as a steam engine; that it is, by reason of its vital properties, capable of receiving external impressions, but it possesses no inherent or vital power to put itself in motion; that the conditions of its activity require external causation; that no organ in the system would act without its proper stimulus. Thus, the eye would be useless without light; the auditory nerve would forever be dormant if not awakened by the vibrations of sound; the impulse of the heart depends upon the condition of an appropriate stimulus; the brain refuses to act without the presence of oxygenized blood. Further, each organ in the system acts as it is acted upon; their action is increased, diminished, or perverted, in precise correspondence with every change of the agency which influences their activity. We behold with profound admiration the wonderful adaptation manifest in all the phenomena of organic life. This is exemplified in the highest degree in man's organism; he conveniently satisfies one essential condition of his existence by inhaling, from the surrounding atmosphere, oxygen properly diluted with nitrogen. He receives as food all the materials necessary to compensate for the continual disintegration of his structure, and to reconstruct when tissue has been destroyed by causality. He possesses facilities for casting out effete and deleterious substances, and for protecting the system against pestilential influences from without. This is the *vis medicatrix naturæ;* it is but the protection which the system derives from the friendly agency of some of its parts. The ample provisions with which we are supplied for existence, health, and comfort, are, after all, not so wonderful in themselves. It is not astonishing that all the

organs and parts do their office according to conditions and apparent design; but the structure, mechanism and adaptation of the organism, and its various organs and parts, are truly wonderful. It is a subject of wonder that the heavenly bodies were formed, placed in their respective orbits, and laws instituted capable of regulating their motions; but when these laws are understood, the movements of these bodies are neither strange nor unnatural. It would only be strange if those luminous worlds were to refuse obedience to the mandatory law; rather would it excite wonder if our Earth were to lose her centrifugal force and fall to the Sun, or if Jupiter were to lose his centripetal force and move into infinitude.

From abundant evidence, of which the foregoing is but a tithe, I conclude that no organic body is exempt from the laws of matter; that the impulse of the heart, as well as the earthquake that rocks kingdoms, is but the legitimate effect of an efficient cause; that of the various organs of an organic system, each acts according to laws which are fixed and harmonious; that, therefore, these actions are necessitated by the force of physical law. Organic activity furnishes a series of unvarying examples of the laws of *cause* and *effect.* A mechanism so complex, possessing so many delicate structures and presenting so much relative dependency of its various parts as the human organism, is of necessity in the highest degree impressible to the slightest disturbing influences; such influences are numerous and their effects upon the system are incessant, though perhaps generally in so small a degree as not to attract notice. It is not until one or more of these influences acts with sufficient intensity to produce notable lesion that the name disease attains; here, too, is presumed to be the dividing line between Physiology and Pathology. Now I maintain the proposition that each organ and part is essentially active to the restraints of physical law, and that they have no more power to evade it than Jupiter has to quit his orbit and visit Mars. As all

organic activity is influenced by primitive external cause, the degree and manner of action are as definitely indicated by condition and cause as effect is indicated by cause on the principles of natural philosophy.

An organ cannot act abnormally; it is natural for every organ to act precisely as it is permitted or influenced to act, and so all organs do act. We may appropriately speak of abnormal structure, but abnormal action is clearly a misnomer. To illustrate—if there is irritation in the brain, no matter how produced, it is natural for the following effects to be produced in rapid succession: local hyperemia, increased oxydation, exudation, and so on, through all the stages and results of inflammation. Here each effect is an additional cause of the progressive activity; and further, the activity, perversion or demolition of the legitimate functions are in precise ratio with the mutations of the conditions on which these functions depend. Here, then, is a morbid process progressing naturally, for it is a series of natural causes and effects. To assert the converse, would be equivalent to saying that effect can exist without a cause. But it may be asserted that these are abnormal actions, inasmuch as they are the effect of an influencing cause; then I answer, so is all organic action the effect of causation, as abundant proof has been presented to establish.

General Pathology, then, as well as Physiology, is an investigation into the conditions of activity, its causes and its effects, both direct and remote, and the design and relative dependency of the several organs and parts of the system. Pursued in this light, pathological investigations, instead of being embarrassed by mystery, will present *in extenso* the pleasing and comprehensive conditions of the laws of life. Every cause has its effect, every proposition has its solution either within the limits of our knowledge, or *incognito*. If a heavy blow on the head is followed by coma, we say there is pressure, because we know it is natural for pressure to produce coma; and the solution is as easy inversely: given

pressure on the brain, we foretell that coma is a result. The kidneys may be deprived of their conditions of activity, their functions are instantly suspended; there is ischuria, urea is permitted to increase in the blood until it becomes an overdose to the brain—coma ensues—the individual is poisoned, not by the doctor's drugs, but by a narcotic poison generated in the system. Again, the system contains largely of phosphate of lime; it forms mainly the enamel and osseous tissue. In pregnancy, this constituent of the mother is diminished because it is drawn largely upon for the organization of the child. This diminution obviously affects the osseous tissue of the mother; her bones become more soft and yielding, and less friable. They are not so easily broken; but if she does suffer fracture of a bone, its union will be slow for obvious reasons.

But pregnancy furnishes another interesting series of causes and effects. The pregnant woman necessarily consumes more than her usual amount of oxygen; hence, the proportion of fibrin in her blood is increased: some of this may be albuminous, or, from any cause, may possess a low form of plasticity, or be incapable of organization; and, if deposited in the lungs or other textures, it may form tubercle. It has several times occurred to the author, to see women having no well marked hereditary predisposition die of tubercle originating in this way; and so we might continue the utilitarian revelations of Pathology to an extent almost *ad infinitum.*

The special facts and general principles drawn from the dominions of Physiology and Pathology are to the physician the nuclei of knowledge, the accessible avenues to skill, and the light of the way. If the leading general principles were well understood, isolated cases would explain themselves; but there is a fatal omission in this; special pathology is grasped after with eager greed, and, of course, is to such devotees as dark as Virgil would be to a Hindoo. Hence, the medical press is encumbered with a profusion of unim-

portant details of special cases which have an easy solution originating in first truths; they are only remarkable as evincing the steadfastness of Nature's laws—they would be wonderful were they otherwise. True, Nature has not yet revealed all her mysteries to the oracles of Science, but we should search for them at the fountain of Pierian lore.

The writer has never appeared before the profession as a chronicler of the wonders which have occurred to him in practice, nor of the strange phenomena which well-defined disease has presented; these are as natural, under the circumstances producing them, as volition, secretion and sleep are in health. So it is natural for fever to suppress secretions, for a clot or tumor in the brain to produce palsy, and for lesion of the cerebrum to dethrone reason.

These views are believed to be sustained by all that is known of Physiology and Pathology; they clearly harmonize with the conditions of our organization, with our relation to surrounding objects, and with the laws of life. But the end of research is not here; momentus questions continue to present themselves.

What is the rationale of the diminution or the absence of chlorides in the urine during the progress of inflammation? It is well established that the presence of an abundant supply of the chlorides is an essential condition of every rapid development by cell growth; hence, large amounts of the chlorides are present in the development of the fœtus; and in every inflammation, or process of exudation necessitating cell-growth, the chlorides are withdrawn from the blood and urine and collected at the scene of lesion. Heretofore, the general principles explanatory of this change in the amount of chlorides in the urine during inflammation have attracted the attention of but few pathologists. But it has been noticed mainly during inflammation of special organs—of the lungs, we may accurately determine the advance and decline of pneumonia by daily observing the presence or absence of the chloride of soda in the urine; if the disease is severe

and progressing, the chlorides are absent; their re-appearance or increase warrants a favorable prognosis. The test is made by pouring a small quantity of sol. argent. nit. into a test tube or vial containing a portion of urine, then add a drop of nitric acid; if chloride of sodium is present, it will be precipitated in a whitish cloud-like sediment.

The toxic action of mercury upon the system deserves some notice, *en passant*, as distinct from its remedial virtues. Manifestly, the declining practice of introducing mercury into the system, to vitiate the nutritive plasma of the blood, arrest nutrition, destroy living tissue, and produce lasting cachexia, is a fateful error; and is only sustained by a theory as fallacious as that which impels the Hottentot mothers to present their infant children as oblations to the watery gods.

The industrious and scrupulous investigator of the workings of the human organism in health and in disease will find error depicted on the pages of many of our standard works, even of recent origin. Our profession has been called the most learned known to man, and so it doubtless is; surely it comprises the greatest body of the most learned men on earth. But, it is repugnant to the feelings to take a retrospect of the deplorable doctrines and destructive practices of the darker ages. The ruthless car of empiricism, as a besom of destruction, swept over the land, consigning the hale to valetudinarianism, and the afflicted as oblations to the common mausoleum of former generations. But a brighter day has dawned. Investigations having been directed in the right channel (*id est*, to physiology, pathology and chemistry), Nature unfolded the mystic woof, and shed a halo of light around her successful votaries.

Although much yet remains in the form of hypothesis, to be verified by careful and continued research—and more, perhaps, to be dreamed of—yet we are encouraged to see the mist of puerile conjecture give way before the light of reason as the fog recedes from the light of the blazing sun. I revere those zealous-hearted and clear-headed votaries to the truths

of Nature's abstruse laws, whether of the present generation or of days of yore, whose researches have contibuted to expand the domain of pathology. Chemistry has rendered material aid to the rational practice of medicine, particularly in those forms of disease which are to be encountered and conquered by the action of direct specific antidotes.

If, while following blind empiricism for six thousand years, chance discovered the remedial virtues of some of our most valued drugs, then we are by an easy transition of thought led to conclude that those great results of popular observation will be more than equalled each year by the positive and veritable results of rational pathology. Think for a moment of the highly utilitarian extent to which pathology has already been carried—of the irrational diagnosis and injurious treatment which are every day giving way under its auspices. Think back a few years, and see how many died of the lancet; of mercury; of antimony. How many have died for want of a sufficiency of cold water to attenuate their blood, and to wash out the *materies morbi* by the emunctories; and, again, how many have died mainly of inanition. All died of the rashness and intolerance of their misguided advisers.

Look at the limited knowledge physicians possessed of the essential character of disease. You have seen them calling symptoms disease, and treating them alike irrationally, till the patient died of the disease and the treatment—or got well in spite of both of them. You have seen the profession bleed, blister and purge their patients for endo-carditis; thus compromising the conservative powers of nature—all with extremely doubtful propriety, as dilatation of the nutrient vessels supplying a part is an essential precedent to the existence of inflammation; and as the membrane lining the heart has no *vassa vassorum*, it is not clear that such disease could exist, the valvular murmur being induced by deposits of fibrin on the valves of the heart. The vegetation found on the valves are very evidently mere deposits of fibrin from

the circulating arterial blood, and not the product of inflammation. See them bleeding their patients repeatedly and copiously, to destroy the fibrin; but the more they bleed, the greater the proportion of fibrin left in the system. See them bleeding pregnant women for neuralgic pains, or merely because they were *incincta.* And the "neighborhood bleeder" had to bleed every pregnant woman in his vicinity; and the doctors *looked wise, and nodded assent.* See them treating typhoid fever and scarlatina, mainly with mercury —collapsing their pneumonic patients with veratrum and antimony—making patients run the gauntlet of ptyalism, thus adding much to the sufferings and hazard of the patient, just because their empiricism told them it was right. But I need not dwell longer upon errors which pathology renders obvious to us.

Among the positive teachings of pathology, we find the accoucher's eclampsia often depending upon retained urea; the autumnal fevers, on retained hydro-carbons; cancer, on living germs deposited from the blood; rheumatism, on a redundancy of uric and lithic acid in the system; stomatitis materna, on inflammation or ulceration in the os uteri or vagina—sometimes in the bowels. Psoas abscess is now known to be as indicative of the strumous diathesis as is phthisis pulmonalis. If in a strumous subject tuberculous matter form and baccili congregate in a gland, bone, muscle, joint, or lung, the essential element of disease is the same in all. Local lesions vaguely called *white swelling, morbus coxalgia, bone erysipelas* as well as strumous abscess of a submaxillary gland, are identical in kind and different only in location from tubercle of the lung. But I cannot couch the manifold utilitarian revelations of pathology in this chapter, or even hint at all its instructive bearings in the rational diagnosis and treatment of disease.

This science having shorn our profession of so many destructive evils, and having contributed so much to establish the practice on a rational basis, in but little more than a

quarter of a century, we may *a priori* expect to be delighted and instructed at every step of our progress, as we solve the abstruse problems of this hitherto sealed book of nature. At every turn of the subject, and in every fresh illustration which it reveals to us, we derive more steadfast conviction of the total absence of chance or irregularity, even in the strangest influences of disease; we become habitual observers of the mystery which tends to preëminently enlighten and to elevate the mind—observers of the immutable uniformity which prevails in the observations of nature's laws! Who would wonder if ere long the whole secret and character of the most obstinate diatheses will be understood—and cancer, phthisis and epilepsy yield as readily to treatment, as do now remittents and urticaria? Things not less marvellous have already come to pass; and so it may be that we shall witness this triumph in our profession.

Already pathological research has vastly lowered the death-rate of puerperal and typhoid fevers; it has brought a flood of light and a boon of relief to the protean ills peculiar to women. May be, if we can learn how to destroy bacteria without injuring the patient, we shall yet fully control diphtheria and scarlatina.

Every intelligent physician will readily agree that a man is a physician just in proportion as he is a pathologist. It is well known that almost the entire amount of valuable information we have of the healing art is derived from the professional sciences, and not from blind empiricism. It is known, that, to an uneducated observer, the workings of a diseased organism is inexplicable and uninstructive; nor indeed can it be otherwise, as philosophers are not made by mere intuition, nor astronomers by viewing the heavens with the natural eye. Those who would get experience in medicine must first get medical science and common sense, as these are absolutely indispensable requisites to the acquisition of experience.

CHAPTER IV.

ETIOLOGY—THE CAUSES OF DISEASE.

Disease is protean, and its causes are numerous; they abound in the food, in the air, and in all our relations with the physical world. Causes of disease embrace all influences and agencies capable of notably changing the quantity or the quality of the blood. Most of the causes act primarily upon the blood, as the excess or insufficiency of food, and the aërial contaminations, such as the mephitic gases and the miasmata, including the effluvia emanating from the bodies of those who are laboring under infectious diseases. Other morbific agencies and influences, however, act primarily on the solids, as mechanical violence, intense cold, and sudden mental emotions; the irritant poisons act coincidently on the fluids and solids.

Pathologists have instituted various divisions and classifications of the causes capable of producing disease; such classifications are more conventional than useful, and are far from being satisfactory; indeed disease itself has been included in most of those lists of causes.

Morbific agencies may be generated within the system, as the retention of an overabundance of urea, lithic acid, the hydro-carbons, and other deleterious excretions; but of these intrinsic causes of disease there are but comparatively few; those above enumerated are the most obvious examples, and in strictness it is even questionable whether they themselves are not the result of external agency.

It is remarkable that a pathologist no less eminent than Prof. C. J. B. Williams mentions excess or defeat of some function ("such as irritability"), or of some constituent of

the body ("as the blood"), as examples of intrinsic causes of disease. Clearly, there is total absence of evidence that these examples are primary causes of disease; manifestly, the former is a symptom of disease, and the latter is disease itself.

Extrinsic causes, or those having their origin without the body, give rise to almost the entire catalogue of individual diseases. Of these external causes, are all the deleterious influences of atmospheric changes and contaminations, and all ingesta, including air, water, food and drugs used as therapeutic agents.

When pathology was in its infancy, causes of disease were classed as proximate and remote; the former class indicated a change of the texture of a part, or lesion of structure—which is disease rather than cause; the latter was less objectionable, as it comprehended all agents and influences capable of deranging the system—these are truly causes of disease. This class of remote causes was afterwards divided into the sub-classes, *predisposing* and *exciting*.

A predisposing cause implies a peculiar state of the system, or of some of its parts, which renders it so highly susceptive that slight morbific influences act upon it in a manner to make deep impressions. This state of the system is disease; so that what have been called predisposing and proximate causes are diseases themselves; therefore, both are elements rather than causes of disease. The term "predisposing," or predisposition, applies best in a general sense to the maladies of the body, which in consequence of its mortality is predisposed to death, and of necessity to disease. But a special predisposing cause of disease can only exist in so far as one disease causes another, or rather, as an element of disease in the body facilitates its own development and progress by enfeebling the system and diminishing the energies of life and resistance; while, on the other hand, the morbific element is intensified by the ceaseless action of numerous causes, both external and internal.

To illustrate, suppose a child is born of strumous parents; in the course of time it has developed the ivory teeth, the squamous nails, the flaxen hair, and the tumid glands—all pathognomonic of struma—all evincing that the primordial cell had been "touched corruptibly." It would be said, in professional parlance, that the individual is disposed to strumous disease: would it not be more in conformity with exactitude to say, the individual is the subject of, or is laboring under, strumous disease? Such person is surely predisposed to further ravages of the disease, but not to a disease already present; indeed, in this example, the primordial cell which developed such individual was *strumous*. This view is in harmony with the deductions derived from extensive observation, with the laws of reproduction, and with the principles of cell development, as presented in the first chapter of this work.

Again, when a part is congested, the minute vessels are mechanically distended by the onus of blood; therefore, any organ that has suffered inflammation is left with its capillaries expanded. This altered state of the texture will, of course, be liable to receive more than a due supply of blood; hence, it is said that a part that has been inflamed is predisposed to a recurrence of inflammation.

The infirmities of old age indicate change of the textures of the body consequent upon the wear of time and use; and these lesions, too, have been erroneously classed as predisposing causes of disease. It may be said with some degree of propriety, that infants are predisposed to cerebral and cutaneous affections. At this early age the brain is in a state of rapid development, and is consequently receiving more than its ordinary supply of arterial blood. This increased amount of blood to, and rapid development of, the brain also explains the fact that opium or other hypnotics, when administered to children, readily produce fatal narcotism.

From the foregoing considerations, it is manifest that the terms *predisposing* and *proximate*, as applied to causes of

disease, have been used synonymously in almost every instance to imply lesion of structure in some constituent part of the body, which is disease itself. As neither of those terms has reference to a class of causes of disease, but each of them is calculated to mislead by representing disease as cause, both may with equal propriety be discarded.

Exciting and *determining* causes are equivalent terms, and are used to imply any or all influences capable of producing disease. To this classification of causes we have no particular objections, though the main effect of these terms used to qualify *cause* is unnecessary verbiage. In order to preserve accuracy, and at the same time accommodate those who insist upon retaining these beautiful adjectives, I would suggest, when disease is already present—when some morbific element in the system is excited into intensity—that the aggravating influence be called an *exciting* cause, and that *determining* cause be applied to morbific influences and agencies when they act with sufficient force to produce disease in a system that is in all of its parts natural and healthy.

Classifications of causes are not so essential as correct ideas of the causes themselves, as the essential character and *modus operandi* of each individual cause. These causes are of divers kinds; they act in various ways, and produce a great diversity of results. We believe it is too clear to admit of doubt, that all causes, of whatever kind or nature, mechanical causes excepted, produce lesion of the structure and derangement of the functions of the system by change in the quantity or the quality of the blood; or, the blood may suffer alterations both in quantity and quality, by the same morbific agency, as illustrated in the operation of the zymotic poisons, and by exposure to cold, damp and inclement weather.

Many of the causes of disease act in a manner so well understood, that we are able to determine or point out their effects *a priori*. We shall proceed to enumerate such causes in detail, and to present some brief considerations upon the

several modes in which they produce alterations of the blood and consequent lesions of the textures of the body.

Excess of Food.—This is a prolific source of disease. Full living, in persons of sedentary habits, and in whom the digestive, assimilative and nutritive forces are carried on with energy, produces plethora, and this in its turn gives rise to hemorrhage, and to that most destructive element of disease—inflammation.

When more nutriment is taken than can be appropriated to the growth or repair of the system, or more than can be assimilated, the excess remains as foreign materials, to be excreted by the emunctories; and while retained they often undergo such changes as to become, *per se*, dire elements of disease. Thus, when the protean constituents of the food are in overabundance, a portion is retained in the blood and is converted into urea, which, when in small excess, acts as a slow poison by contaminating the blood in a manner that leads to chronic inflammation and effusions. But when the amount of urea in the blood is in large proportion, its toxic action is more intense and decided—producing the most profound coma and the most alarming convulsions. In this way doubtless originate puerperal convulsions, or the *eclampsia* of pregnant and parturient women. The last mentioned effects have been ascribed to carbonate of ammonia, into which the urea has been converted in its retrograde march to a lower form of protein principle.

That the waste material of certain tissues passes into urea, and thence into ammonia, is pretty certain; and it is a corroborative fact, that all practitioners have met the strong ammoniacal odor in the apartment of the emaciated typhoid patient, and as certainly at the couch of the convulsed accouchée.

Excessive indulgence in delicious wines, and highly azotized food, produces an excess of azotized material in the blood. This material is in the form of lithic acid, and is the *materies morbi* of gout; and by combining with soda, or

ammonia, as a base, forms renal and cystic calculi; hence the near relation between gout and gravel. Those who partake largely of food rich in hydro-carbons, and breathe a heated and rarefied atmosphere, get an insufficient amount of oxygen to consume the combustible material taken in the food, so that more work devolves upon the liver than it is able to perform; the result is, this organ is overworked and becomes torpid, the hydro-carbons contaminate the blood, and bilious attacks and a train of paroxysmal and periodic diseases follows. Large quantities of food taken at once enfeeble the stomach, exhaust the supply of gastric juice, and lead to gastritis and torpor of the digestive apparatus, and to consequent indigestion with oligæmia and its train of evils such as debility, nerve pains, and hypochondriasis.

Insufficiency of Food.—The effects of withholding the requisite amount of nourishment to supply the demands of the system is easily foreseen. Just in proportion as this pabulum is diminished will the blood suffer diminution of its plastic elements, and assimilation and nutrition will be suspended in corresponding ratio. Hence, we have produced anemia or oligæmia, with emaciation; indisposition to mental effort; a sluggish performance of all the functions, and prostration of the physical powers. This state of the system is not a mere predisposition to disease, as it has been termed, but it is disease itself. To be sure, any disease exposes the system not only to its own ravages, but to the ingress of all surrounding morbific influences: and so the ill-fed anemic has little capability of resisting the encroachments of the noxious miasm, or the deadly effluvia that lingers in each successive breath, but is a ready prey to every morbific influence, whether it is sporadic, epidemic, endemic, or contagious.

Excessive Evacuations are exhaustive to the blood, and particularly destructive to its corpuscles. A profuse discharge from an ulcer or an issue, excessive sweating, leucorrhea and chronic diarrhœa, are alike colliquative, are attended

with rapid loss of flesh and blood, and tend directly to produce anemia and its concomitant results. Each condition or state of the system that gives rise to these evacuations is disease: here, then, are familiar examples of disease acting as causes, but it is clear that they are not predisposing causes.

Mercury and antimony, when their use is persisted in, or when used without great caution, destroy the red corpuscles and the crassamentum of the blood, and produce anemia and debility, and sometimes lasting cachexia. Hemorrhage produces the most sudden anemia and debility. The breathing of air poor in oxygen produces venosity of the blood, and indigestion with its results. Mental depression enfeebles the mind, interrupts digestion, deteriorates the blood, and retards assimilation and nutrition.

Connected with mental emotions are many prolific sources of disease. Young females devoted to the reading of novels, or who accustom themselves to the no less impure associations of theaters and dancing parties, are apt to live into the indulgence of voluptous imaginings which excite the womb and ovaries into an irritable and often into an incurable condition —shatter the nervous system—blast the hopeful bloom, and entail lasting misery.

Great and sudden emotions of anxiety increase the secretions in an unequivocal manner; hence, a nursing woman's anxiety about her child, when absent from it, increases the flow of milk. It is proper to remark here, that if the nursing mother is laboring under the influence of extreme anger or grief, her milk will produce disease in the child; so that ill-tempered women are apt to have colicky children. Besides, long continued grief tends to produce *dementia;* and a mind encumbered with some depressing thought, often becomes so habituated to its unpleasant operations that it evades other subjects, and clings to the pang of despair, and monomania is the result.

Exposure to Cold.—The first impression of cold is invigorating to the superficial capillaries and to the muscular

fibres; but this effect is but transient, and is followed by permanent debility. Cold applied to the body causes contraction of all the vessels near the surface, which diminishes their calibres and drives the blood into the internal organs. A person long exposed to cold is apt to suffer inflammation of some of the viscera, and this is rendered more probable by the circumstances that the air is condensed and rich in oxygen, and the blood therefore highly oxygenized. Besides, the capillaries throughout the system become enfeebled—those near the surface, by being forced to contract; and those that are deep-seated, by being distended by the onus of blood during long continued or often repeated congestion. In addition, the excretion of waste material is scarcely in proportion to the increased amount of ingesta taken during cold seasons: so that the system is exposed to inflammation and to the most grave forms of continued fever.

Heat relaxes and debilitates the system by the continual and rapid excretion and renewal of the serous portion of the blood. Oxydation goes on tardily, and the blood contains an unusual amount of excrementitious material, much of which finds exit through the pores of the skin. This condition gives rise to bilious derangements, and facilitates the ravages of the animal poisons.

Alcoholic Liquors, in small quantities and skillfully directed, promote the appetite and digestion, and diminish the waste of the tissues; but used habitually and unguardedly they are irritant poisons, and in large quantities they are narcotic poisons. By long continued and excessive use they irritate the stomach and diminish both appetite and digestion; they irritate the brain and nerve centres through the blood, and produce wakefulness and *mania a potu;* they irritate the glands engaged in eliminating them from the blood; hence, drunkards frequently have renal, and more frequently hepatic disease, because they furnish more hydro-carbon to the blood than the liver is able to excrete; besides, the structure of this organ often suffers lesion by the alcoholic

irritant. Thus the capsules of Glisson becomes thickened, which obstructs the flow of blood through the hepatic vessels, and leads to congestion and ascites.

Local Irritants cause disease readily by augmenting the quantity of blood in the part to which they are applied. The familiar language, *ubi irritatio ibi affluxus*, well expresses the constant and immediate effect of irritants. To this class belong all agencies capable of exciting a part and bringing an increased flow of blood to it, whether they are said to act mechanically, chemically, or vitally. It is well to remark, that the blood which a local irritant invites to a part is mainly arterial; therefore, the congestion it produces is of the active variety.

Marsh Malaria.—The great prevalence of paroxysmal fevers and other affections characterized by periodicity and hepatic derangements, in marshy districts, is familiar to physicians, particularly at the West. The exact cause of these diseases has been the subject of much investigation, and has led to a great contrariety of opinions, and is yet *incognito*.

Prof. M. L. Linton finds sufficient cause for their production in generous living, on food rich in hydro-carbons, while breathing an atmosphere heated, rarefied, and consequently poor in oxygen. This appears to be logical, and doubtless defines an efficient cause. It is true that those diseases do occur on high lands, and are there obviously engendered by the causes which Dr. Linton has shown. But may they not find in those marshes a potential auxiliary? If not, why do these peculiar forms of disease occur in the marshes so much more frequently? There is no proof that a peculiar miasm or virus exists in those swamps; but there are obviously miasmata produced there by the damp air, stagnant water, and the decomposition of vegetable substances. It is a corroborative fact that ague, bilious fever, and dysentery, prevail on the western prairies most in the vicinity of wild lands that have recently been ploughed, and upon which heavy

coats of grass are decaying. And further, those diseases are of comparatively rare occurence in neighborhoods where all the adjacent lands have been cultivated.

Whatever is the cause of these diseases, it acts upon the system through the blood, which becomes highly charged with hydro-carbons and waste materials which do not find a ready exit through the emunctories. Besides, the soft tissues are expanded and flaccid, inviting a flow of blood, and giving to all these forms of disease a congestive tendency; hence arises that state of extreme prostration, cold surface, and congestion of most or all of the internal organs, which is denominated congestive chill.

The *coup de soleil*, or sun-stroke, is evidently a sudden rush of carbonaceous blood to the brain.

Temperaments.—These are generally results of hereditary transmission; at any rate, they are conformations or peculiar deviations from a normal state of the system, and cannot therefore be regarded as prime causes of disease. A well marked temperament complicates or modifies disease so far that it demands the special consideration of the physician, both in diagnosis and in treatment.

Endemic Poisons.—Certain localities appear to be nurseries of peculiar causes of disease. Though these morbific agencies are noncognizable, their presence is inferred from the circumstance that certain peculiar forms of disease are common to those localities; these affections are called *endemic*, which name implies that they have been considered as existing *in* the people of a certainty vicinity. To this class of causes have been assigned ague, and all other affections common to the inhabitants of marshes and jungles. The inhabitants of deep valleys are subject to an endemic affection known as bronchocele or goitre, which is characterized by enlargement of the thyroid gland. It has been supposed that drinking snow-water is the cause of this affection; but obviously the triple cause is exclusion from light, breathing a humid atmosphere, and hereditary transmission. This

affection is not uncommon in this country, and is invariably a manifestation of scrofula.

Among the noncognizable causes of disease should be included an unknown *virus* which is common to certain localities in some of the Western States; nothing is yet known of the mode of its origin or the form in which it exists, but its *modus operandi* as a poison is better understood. Its immediate effects upon the system are constipation, irritable stomach, depraved nerve force, and lassitude of the voluntary muscles. It is nocuous to all of the domestic animals, and people get infected by eating the flesh or milk of animals that are infected with it; hence the disease it produces is called *milk sickness.*

Epidemic Poisons.—Closely allied to the endemic, but verging on to the well defined contagions, is another class of peculiar causes which engender a family of diseases denominated epidemic, because they are not confined to any particular localities, but come *upon* the people at irregular intervals like the blighting sirocco of Malta.

These forms of disease appear to depend upon transient conditions of, or changes in, the atmosphere; that is, upon the presence in the air of some unknown but efficient cause which produces in many people, coincidently, *la grippe*, catarrh or pneumonia, or gives a hemorrhagic tendency or a low type to all diseases, for an indefinite period, till it is exhausted, or rushes on to extend its unwelcome visit and scourge other communities with the pang of suffering and the gloom of death. Epidemic influences often give intensity to sporadic diseases, and to contagions as well. On the other hand, some forms of disease which are presumed to be the result of epidemic causes only are positively contagious. As examples, cholera and typhoid fever are here presented; and even dysentery sometimes presents a malignant grade, which renders it capable of propagating itself through the noxious exhalations and emanations from the stools or body when on the verge of putrefaction.

Infectious Poisons —Contagion.—No real difference of meaning is understood to exist between the terms "infection" and "contagion." Any form of disease capable of propagating itself, or of being communicated in any manner from one person to another, is contagious; that is, it is "catching." The communicability of most of the contagions depends upon essential conditions; thus, to infect with the virus of hydrophobia, or cow-pox, they must be introduced into the system through a wound or abrasion. Others may be communicated either by inoculation, by contact, or through the atmosphere, as small pox. Syphilis may be communicated by inoculation with pus from a chancre, and also by contact, or it may be imparted through the saliva by a voluptuous kiss. Gangrene may be communicated by inoculation, or by inhaling air saturated with the virus.

Measles, scarlatina, diptheria and typhoid fever, are communicated through the atmosphere; and to this list belongs cholera, which, though it is perhaps a more feeble contagion than scarlatina, and, although it may exhibit its greatest activity in the presence of certain independent aërial relations, yet it as absolutely, though not so actively, contagious as small pox. I do not base this declaration alone upon either theory or observation, but both alike proclaim the incontestable truth. The emanations from the body of a person laboring under cholera saturate the surrounding atmosphere with the effluvia or virus, which is capable of communicating the disease to those who chance to inhale it. Cholera is propagated in the same manner as measles, but is not so certainly communicated under the same degree of exposure. So measles and small-pox may be communicated in the same way, yet no one will say that the former is as actively contagious as the latter; but the former does not cease on this account to be a contagion, neither does cholera.

But it is said, cholera is in the air—that we have such a thing as a cholera atmosphere. It is granted that certain states of the atmosphere promote the activity of all the con-

tagions; but when a pestilential disease, such as small-pox or cholera, is rife in a community, and scores, perhaps hundreds, of infected bodies are emitting from each contaminated and decaying organism abundance of noxious effluvia, and filling the air with the seeds of pestilence and death, surely we have a small-pox or a cholera atmosphere, if we had not before. It is no proof of the negative to say that people sometimes expose themselves to cholera with impunity; the same may be said of small-pox, which is the most active of all contagions. On the other hand, the fact is established beyond reasonable doubt or controversy, that many who expose themselves to cholera have been contaminated with the infection. There are numerous instances of an individual having been exposed to cholera, and traveling, during the incubative stage, for many miles, carrying the latent virus, that soon manifests itself and spreads till it infects most of the inhabitants of a town, and brings pestilence upon an entire community.

As to the infective or contagious character of cholera, the day of doubt has passed. Its repeated unhappy visitations present affirmative evidence more positive than the type or quill can present, and far more forcible than pride or prejudice can withstand.

At one period in medical history much discussion occurred as to the essential character of the infectious poisons. Two theories (the Zymotic and the Parasitic) were presented, and each found able supporters; but the zymotic theory of infection for a time prevailed. It is now pretty clearly established that these diseases depend upon a morbid poison derived from infected animal bodies; that a minute portion of this virus entering the blood in any manner, whether from the air through the lungs, or by inoculation, is capable of contaminating the whole system by a process of fermentation or with bacteria in some instances. The parasitic theory is based upon the hypothesis that infection depends upon, and is communicated by, living parasites floating in the air.

This theory is, perhaps, not more strange than absurd; yet it is known that itch depends upon a parasitic animalcule, and that favus is caused by a vegetable parasite; also diphtheria.

Before leaving the domain of Etiology, it is well to present the following deductions derived from the principles advanced, viz.: Causes of disease comprehend all agencies and influences capable of producing notable change in either the quantity or quality of the blood. All causes do act in this manner, and in no other way. All changes in the solids (mechanical injuries excepted) are preceded and produced by adequate changes in the blood. It is obvious, too, that each agency and influence classed as a cause of disease, as well as each substance taken into the stomach, whether it is a drug used as a medicinal agent, or as food for alimentation, produces some change in the amount, constituents, or quality of the blood; and that, therefore, either of these agencies or influences may be so used as to produce or to counteract disease.

It is an important fact that the ocean of atmosphere in which we live, and from which we breathe, is the common receptacle of all the effluvia that emanates from infected human bodies, as well as of the great abundance of miasmata emitted from decaying organic bodies and numerous other sources. Since the atmosphere is so easily contaminated with effluvia, it follows that infection or contagion has a wider range of activity than has heretofore been ascribed to it or admitted.

Neither health nor disease is a condition prescribed and maintained by the inevitable decree of fate. Either of these states of the system may be produced as the result of efficient cause, but neither of them can exist except as the result of such cause; so that as Etiology comprehends all agencies which under certain circumstances are causes of disease, Therapeutics comprehends all agencies which under certain circumstances are causes of health.

CHAPTER V.

ELEMENTS OF DISEASE.

The preceding deductions drawn from the domain of etiology evince clearly, we think, that all causes of disease proper affect the system through the blood, and in no other way; and since disease invades the system through this medium, it is fair to conclude that the essential protopathic elements of disease consist in changes in the blood, either quantitative or qualitative, or both. The blood may be changed both in quantity and quality almost coincidently, as by the action of the irritant poisons. It is clear, too, that a change in quality of the blood can not proceed far without becoming complicated with quantitative change, and *vice versa;* and since by a rapid metamorphosis the blood is continually being transformed into tissues, it is obvious that the solids suffer corresponding lesions consequent on the previous changes in the blood. These changes in, or lesions of, the solids also constitute elements of disease; but evidently these are not primary or protopathic, but secondary or deuteropathic elements, which themselves may give rise to tertiary elements or affections, and so the elements of disease may be multiplied by these numerous sources of origin almost to infinitude.

The blood carries in its torrent the progressive and the retrograde elements of the tissues; it contains a mixture of the histogenetic and histolytic materials of the body. Its plastic elements are constantly being transformed into textures, and, on the other hand, the textures are constantly adding their waste materials to the volume of the circulating current.

Besides, the blood is the receptaculum of all the effluvia that pollutes the air we breathe, and of all the deleterious substances that are taken into the stomach, either as aliment or as medicinal agents. It is in the circulating blood that these heterogeneous substances and elements mingle together, and consequently it is in this delicate organic fluid we must look for the protopathic elements of disease.

But it may be said this is *humoralism*. Well, suppose it is. It is also evidently the palladium of rational and scientific medicine, and is the base upon which our art, guided by the beacon light of science, will eventually rest in security. Has any physician the credulity to believe that cause can exist without effect—that the solids can exist without the fluids—or that change in the blood can exist without producing corresponding change in the structures and functions of the textures? The blood of one hour forms a part of the tissues of the next, so that the tissues are virtually but the blood at rest.

Since the time of Harvey much importance has been attached to the alterations of the blood as connected with certain forms of disease. In early times it was supposed that there are but few affections in which the morbid impress is first made upon the blood, and even yet we sometimes hear of a *blood disease* as if it were a prodigy. But as physiology and pathology have advanced, and particularly as that important branch of the latter—etiology—has been cultivated till it has become an efficient auxiliary in determining the *modus operandi* of causes and the essential character of disease, it has become evident that the prime elements of all the varied forms of disease consist in alterations or changes in the quantity and quality of the blood. Hence, the black blood of Hippocrates—the alkaline and the acid blood of Van Helmont—the *error loci* of the blood corpuscles of Boerhaave. All these were meager but well-directed foreshadowings of an important truth, and in their turn, more recently, lead to important investigations into the prop-

erties of blood coagula by Gulliver, into the effect of emboli by Virchow, to the discovery of leucocythemia by Bennett, and turbercle baccilli by Koch.

Andral conceived a happy thought when he referred all disease to the following five classes of lesions: first, lesions of the circulation; second, of nutrition; third, of secretion; fourth, of the blood; fifth, of innervation. This classification was evidently defective, but it was an advancement, and an approximation to eternal verity.

But it remained for an American physician—Linton—to demonstrate that Andral's lesions of secretion and innervation are but symptoms of disease, and to incorporate the three remaining classes more comprehensively into qualitative and quantitative changes in the blood, and corresponding changes in the solids consequent thereon. The classification or formula of Dr. Linton, of which the following table is a modification, will perhaps never be improved or modified further than is implied in the suggestion already made—that the prime elements of disease consist in quantitative and qualitative changes in the blood, so that the alterations or lesions of the solids being consequent thereon are secondary elements.

PRIME ELEMENTS OF DISEASE.

- Changes in the quantity of the blood.
  - General.
    - Plethora or Hypermia.
    - Anemia.
  - Local.
    - Hyperemia, Active. Passive.
    - Anemia.
- Changes in the quality of the blood.
  - Consisting in variations of its constituent elements—as in the fibrin, albumen, globules, etc.
  - Consisting in retention of matters destined for secretion, etc.
  - Consisting in contaminations with foreign poisons, as the miasms, baccilli, etc.

SECONDARY ELEMENTS OF DISEASE.

Changes in the solids consequent on the foregoing.	Increased nutrition (hypertrophy). Decreased nutrition (atrophy). Perverted nutrition produces all other changes to which the solids are liable, as tumors, both benign and malign.

Manifestly this classification includes every known element of disease. It is plain that the quantity of blood may be increased above, or diminished below, the normal standard, and that this increase or diminution may be general or local. It is clear, too, that a change in the quantity of the blood in any of these ways is an element of disease. Thus, if the quantity of blood be increased generallly, it is disease—it is plethora or general hyperemia. If the quantity of blood be increased locally, it is local hyperemia or congestion. Surely this, too, is an element of disease. If the quantity of blood is diminished generally, there is general anemia or oligæmia; and if diminished locally, there is local anemia.

Changes in the quality of the blood, including all known bacteria, are also elements of disease. Thus changes in the component elements or constituent parts of the blood constitute various elements of disease, as does the retention of materials destined for secretion and elimination; also, the miasms which are received into the blood from the atmosphere through the lungs.

Disease is prolific; hence, each element is capable of producing results which become *per se*, elements of disease. So that the forms of disease are varied and numerous, though the prime elements are few. Thus, a general increase of the quantity of food constitutes general plethora, and this condition gives rise to local congestion, apoplexy, or exhausting hemorrhage. If the increase of blood be in a local part, the prime element is congestion, or local hyperemia, which may produce hyper-nutrition and hypertrophy,

or increased oxydation, and all the results of inflammation may follow, and general anemia and its results are among these consequences. In this manner one element of disease may generate another, till the system undergoes a countless succession of changes. If the quantity of blood in the system is diminished below the normal standard general anemia is present as an element, giving rise to a train of affections connected with the nutritive process. If the blood is diminished locally, the local anemia gives rise to diminished nutrition and atrophy of the part. So much for a cursory view of the changes in the quantity of the blood as morbific elements.

Changes in the quality of blood are almost innumerable, and in these consist the elements of various communities of disease. The zymotic poisons and all the contagions, whether communicable through the air or by inoculation, are elements of this class. All morbific ingesta, whether in the form of air, water, food, or drugs, are capable of altering the quality of the blood, and thus becoming elements of disease. Diathesis, and almost all diseases capable of hereditary transmission, are included in this very large class of affections, the prime elements of which consist in qualitative changes in the blood. Any element, whether it is protopathic or deuteropathic, may give rise to other elements, and they in turn may give rise to other affections or complications, differing widely in their character from the prime element. Thus the quality of the blood may be changed in the following manner: the albumen which in health should be to the whole volume of the blood in the proportion of 80 to 1,000 parts, in disease may be increased to 100 or 120 parts in 1,000, and may be so diminished in plasticity as to assume a low form; and if deposited in the lungs or elsewhere, will, by an abortive organic effort, develop tubercles, which, in their crude state, may, by mechanical irritation, generate an inflammation. Here, then, is an element quite different from the original one. Such examples are numerous, and will readily suggest themselves to the reader.

We think that a moment's reflection will make it clear to every mind accustomed to methodical thought, that all lesions of the solids, not produced by the direct action of some mechanical or chemical agent, are secondary elements of disease, being consequent upon some preëxisting element that consists in alteration of the quantity or quality of the blood. For instance, congestion, which we have seen is itself a very important element of disease, may, by the onus of the congestive element, rupture a minute vessel and give rise to hemorrhage so exhaustive as to induce anemia with its train of concomitant evils, or it may be attended with effusion of serum into some of the splanchnic cavities, or among the tissues constituting the various forms of dropsy, or it may be attended with hyper-oxydation and all the results of inflammation, including destruction of the textures involved, or it may be attended with hyper-nutrition and hypertrophy of the part, and lead to results more or less serious, according to the importance of the organs or parts involved. Surely in all these examples, and in every instance that can be suggested, the alterations or lesions of the solids are results of prime elements of disease consisting in previous change in the blood, quantitative, qualitative, or both.

Andral's lesions of nutrition answer to these secondary elements of disease or lesions of the solids, but it is very evident from what has already been adduced that all possible lesions of nutrition are consequent upon previous changes in the blood. The blood forms and nourishes the tissues, therefore it is obvious that any notable change in this plastic fluid, whether qualitative or quantitative, must of necessity produce corresponding changes in the structures and functions of the various organs and parts. The essential conditions of nutrition are: first, a due supply of nutritive aliment; second, the assimilation to the blood of its plastic elements; third, the appropriation of these elements to the various organs and textures of the system, in kind and quantity adequate to their several demands. This power of

distribution and appropriation of the plastic elements of the blood to the various organs and tissues has been ascribed to some influence inherent in the textures. It is extremely doubtful whether, under any circumstances, the organs or textures possess this inherent capability, and it is certain that the histogenetic process is governed and directed entirely by the blood; that the blood must be of such quality and quantity as to contain all the required materials in just proportion; that it must contain them in sufficient quantity, and not in over-abundance, and that it must be in equilibrium.

The blood may be increased, decreased, or contaminated, and the corresponding results are—increase, decrease and perversion of nutrition, and of organic activity; so that it is very clear that the textures do not regulate and control the nutritive process; but that the blood furnishes the nutritive material, forms the organs and textures, and regulates their functions. The foregoing considerations present the process of nutrition in a comprehensive light, and upon principles entirely reasonable and corroborative of all that is known of organic life or physical law, into which what have been called *vital power* and *organic force* are rapidly converging.

Each kind of tissue receives from the blood such material as its own peculiar structure requires, and the influence which regulates these supplies and draws the material from the torrent of the circulation has been ascribed to attraction, and the appropriation to each kind of tissue of the special constituent of the blood which its growth or repair demands, has been ascribed to selection or choice on the part of the textures.

But it is most consistent with all that is known of the operations of the animal economy to conclude that the textures are entirely passive to the nutritive process, and that certain constituents of the blood are supplied to each of them to answer their several demands, in consequence of affinity existing between each kind of tissue and certain

elements of the blood. This mutual affinity is evidently the influence that furnishes to the brain unoxydized phosphorus, to the muscles albumen, and to the bones and cartilages phosphate of lime. To suppose these tissues capable of exercising choice in obtaining their appropriate material from the blood, is as absurd as to attribute volition to the heart, or supreme munificence to a Pagan god.

Then it is evident that lesion of nutrition consists in change in the blood, either qualitative or quantitative, the effect of which upon the tissues is corresponding alteration of their structure. Thus, if nutrition is increased in a part, the result is hypertrophy; if diminished, the result is atrophy; if perverted, the result, is atheromatous or heterogeneous tumor, or the deposit of tubercle will be likely to occur if the nutritive material is diminished at the same time. Could either of the above mentioned changes in the solids occur without being preceded by changes in the blood? No. Can *any* change that is not the result of violence occur in the solids without being preceded and caused by change in the blood? Surely not.

The following propositions are now pretty clearly established: that the prime elements of disease consist in changes in the blood; that lesion of nutrition must be preceded by change in the blood; that the lesions of structure are secondary elements of disease, and are consequent upon previous changes in the blood.

Before closing these general remarks on the elements of disease, it is well to state that when any morbific element is in the system, it is disposed to direct its violence upon some certain kind of tissue; that is to say, as in the nutritive process each kind of tissue appears to have affinity for some proximate element of the blood, so each appears to possess a kind of affinity for certain peculiar morbific elements. Thus the venereal poison affects the generative organs; mumps affect the parotid glands; scrofula affects the glandular, and finally the osseous structures; rheumatism, the fibrous

tissues, and the poison of typhus affects the nervous tissues and the mucous membranes.

Not only in the elements of specific diseases is affinity manifested, but it declares itself in the *materies morbi* of epidemic and endemic affections as well; and even in sporadic diseases the same phenomena are presented. Thus, if an individual suffers with inflammation of the pleura, it is evidence that all the serous membranes are alike disposed; and this is true of each of the various kinds of tissue that compose the system.

It is important in each special disease, if possible, to determine the character of the prime element, and to discriminate closely between the idiopathic disease and the consequent affections and complications which it engenders. A clear distinction should be observed between disease and symptoms—between lesion of the organization and derangement of function. Functional disease is a misnomer, and a cloak for ignorance.

CHAPTER VI.

QUANTITATIVE CHANGES OF THE BLOOD, AND THEIR RESULTS.

The blood in the healthy adult weighs about thirty pounds; it is the *pabulum vitæ*, and is continually moving in the circulatory system, which is a perfect hydraulic apparatus. As this organic fluid is circulated in a system most delicate and complicated, we would conclude *a priori* that its equilibrium would be readily and frequently disturbed; and so we find that it is very liable to quantitive changes, general and local, and that such change in one part necessitates corresponding change in other parts; thus, congestion of the brain induces anemia of the feet. These quantitative changes and their results, as we shall see further on, comprehend many elements of disease.

General anemia, or, in literal strictness, *oligæmia* (which signifies little blood), is caused by whatever exhausts the blood, or prevents its formation. Of the former class of causes are hemorrhage, contaminating influences, and inordinate secretions; of the latter class is imperfect assimilation, whether from deficiency of aliment taken as ingesta, or from such digestive or assimilative derangement as prevents the nutriment from being appropriated to the blood. General anemia occurs mainly at the expense of the iron and red corpuscles of the blood, and the diminution in volume is usually compensated by increased additions of water to its serum; hence the frequent coëxistence of anemia and hydremia.

The *symptoms* and *signs* of general anemia are generally well marked and declarative of its presence. The skin is

pallid, and whether there is emaciation, or a symmetrical and rounded fulness of the soft textures, the evidences of anemia are still obvious; there are softness and flaccidity of the muscles, impaired contractility of their fibres, and deficiency of their power, and therefore a corresponding degree of physical debility. When anemia has reached an extreme degree, the mind is very impressible by moral influences, while the mental faculties are enfeebled and incapable of investigating abstruse propositions. Impaired nervous energy is usually present as a consequence of deficient nutrition, and in this condition there is often exaltation of certain nervous centers, which give rise to heightened functions of the nerves over which they preside, as frequently evinced by neuralgia and hyper-esthesia. These phenomena, as well as those pains, erroneously denominated sympathetic, which manifest themselves in parts remote from a local irritation or inflammation, depend on irregularity in the distribution of reparative material, or a want of balance in the nutritive process. This state is well exemplified by the excruciating pains, excessive tenderness of parts, and the impressible mind common to hysterical females: though these may come half solicited, they are to the sufferers terrorism, and are the effects on the mind and nervous system of anemia, particularly when it is associated with uterine derangement.

Treatment.—The principles on which the treatment of anemia is directed are obvious enough; the signs and symptoms are indicative of the state of the system, and this condition in turn plainly indicates appropriate remedial measures. Tonics, nutrients, pure air and moderate exercise, with such measures as may be necessary to restore or maintain a healthy condition of the digestive organs, are the most efficient means in the treatment of anemia, and are decidedly and certainly curative. Of course, complications when present are to be treated according to their indications; if anemia is kept up by excessive secretions, exhaustive discharges, or

other causes, such additional means as are calculated to arrest them, or remove the conditions on which they depend, will be necessary.

Local anemia may be produced at will in any part that can be exposed to moderate pressure or extreme cold. Congestion of the abdominal and thoracic viscera produces anemia of the skin; cerebral congestion causes anemia of the extremeties; or when the motor power of a limb or the functional activity of any organ is suspended, anemia of the organ or part is the result. And further, when the supply of blood to a part is diminished, the nutritive material is of course correspondingly withheld from the part; so that as anemia is the result of pressure or inactivity, so atrophy is the result of anemia. Hence, we find atrophy of the muscles of a palsied arm or leg, and of glands which have long remained dormant. If from any cause one kidney suspends functional activity, it receives less blood and deficiency of nourishment, and therefore becomes atrophied; while its fellow peforms an increase amount of labor, and receives augmented supplies of blood and nutritive materials, and therefore becomes enlarged or hypertrophied: so that, under these circumstances, the relative difference of size between the two kidneys in the same body is considerable. Men who abstain from connubial rites, and avoid the excitement of coition, are liable to atrophy of the testes; and it is an obvious and important truth, that the brain of a person unaccustomed to the exercise of the reasoning faculties is not nearly so well developed as that of an individual devoted to thought and mental culture.

It is in order to mention, in this connection, an obvious fact which many eminent authorities in the profession have sought to invalidate, to-wit: that certain faculties of the mind do originate in and belong to definite special localities of the brain. As these faculties of the mind are exercised, their appropriate regions of the brain receive increased supplies of blood and nutritive materials, by which development

is accordingly augmented; so that the brain, like other organs, perishes by inactivity, and is developed by the exercise of its functions. But the brain does not act as a unit; for it is clear that each of its various regions has independent functions, with but a relative dependence on each other, and that the various dispositions and grades of intellect in people depend on as innumerable differences in the structure and development of the various regions of the brain. These differences in development may be natural or cultivated; so that these truths do not proclaim irrevocable fate, but that each individual is a free agent, and capable of successfully cultivating his or her own brain, and improving the morals and the intellect. These views are sustained by plain physiological facts; to deny them is as absurd as to deny the circulation of the blood—and this was denied by leading men in the profession for more than a century after it was discovered by Harvey.

The objection that the bony covering of the brain prevents its development, is too frivolous to notice here. It is disproved by physiology and by the reason and experience of everybody; besides, it defines the veritable teachings of philosophy and physiology; while, on the other hand, we are sustained by the following facts, to-wit: No particle of matter is exempt from the philosophical law of cause and effect; the brain is not exempt from the physiological law that active exercise of the functions of any organ, or part, increases the amount of blood distributed to it to augment its development. Hence, in profound study we exercise the brain, and especially a certain region of it, by which its supply of blood is increased, its development augmented, and its faculties expanded. Disprove these evident propositions, and thought is useless, physiology is a delusion, and philosophy but a chimera; we could neither progress in the science nor grow in morals.

It remains yet to notice some facts in support of the localization of particular faculties of the mind in special regions

of the brain. This proposition is established by many conclusive evidences that the brain does not act as a unit. The faculties of the mind are not developed contemporaneously, but at different periods of life, and in the same independent manner do these faculties decline; thus conforming to the general mechanism of the system, in which each organ is assigned special functions and periods of activity.

That each of the powers of the mind is as independent of, as distinct from the others, is well exemplified in disease. In typhoid fever, the sufferer readily recognizes acquaintances when every other faculty of the mind is perverted or abolished. Some insane persons have more sense on some subjects than they ever had before. Monomaniacs are perfectly rational in some of their faculties, while the other faculties are entirely abolished. Indeed the whole nervous system is constructed on this principle of special localization and definite independent functions, as shown by the separate localities and definite functions of the ganglia and nerves of sensation, motion and vision. This arrangement of the nervous system and the comparative anatomy of the entire organism have been presented in support of the special localization of the functions of the brain by Prof. J. W. Draper of New York.

The author does not propose to endorse all the minutia that may be taught as phrenology; but that the leading propositions of that science are as true as the cardinal principles of physiology or physics, is believed to be placed beyond cavil by many incontrovertible facts, only a few of which are here adduced.

But to proceed: we were considering atrophy as a result of local anemia, but this element of disease has a range of consequences far beyond simple atrophy, which consists in diminution of the bulk or structure of an organ, or part, without any change in the normal character of the tissue. But there may be both diminution and alteration of the structure of an organ. Simple diminution of structure is

but a stage in the decay of an organ deprived of blood and nutrition, beyond which morbid degeneration of the remaining texture may occur. These morbid degenerations of texture are, according to Dr. Bennett, of four varieties, viz.: Albuminous, Fatty, Pigmentary and Mineral.

Albuminous Degeneration.—Albumen is a highly nutritious substance, and is truly protean in the great variety of changes to which it is liable. It readily becomes the fibrin of muscles, the gelatin of bones and cartilages, and it contributes azotized material to the formation of the walls of the blood-cells; and, on the other hand, the tissues of muscles, glands, and other textures, are capable of degenerating into an albuminous substance, as the consequence of suspended or perverted nutrition.

The writer has more than once observed in post mortem examinations of the subjects of pulmonary tuberculosis, that the liver was small and oily, and presented to the eye a pale or whitish color. Manifestly such structural changes are the results of imperfect nutrition. These lesions are not easily diagnosed, and therefore do not often receive special treatment. It is, however, advisable, on any reasonable evidence of the presence of such lesion, to resort to such measures as give activity to the nutritive process.

Fatty Degeneration.—This is a lesion which most of the textures of the body are liable to suffer. It may affect the muscles, both voluntary and involuntary, but is less frequent in the latter, though the heart is not unfrequently attacked, especially in persons of a lymphatic temperament, and in whom the contractions of this organ have been enfeebled by previous disease. This morbid degeneration may be found in the osseous, glandular and nervous tissues, giving rise in the former textures to a form of mollities, and in the latter to romollesence; but this degeneration is not the only pathological process that leads to softening of the bones nor of the brain and spinal cord. The placenta, false membranes, and morbid growths, are all liable to this lesion.

The *causes* of fatty degeneration are pretty obvious. Imperfect nutrition is an essential cause common to all the groups and varieties of degeneration of texture, and with this, various incidental circumstances and transient influences combine to give rise to the different varieties. Fatty degeneration is caused by anemia, and such other conditions as deprive an organ, or part, of its usual supply of nutritive material, while the fats and other hydro-carbons are actively assimilated and appropriated to it in due or over-abundance, so that the suffering organ is fed by and converted into fat. There is, then, this essential difference between fatty degeneration of texture and fatty deposits or growths. In the former the fat is formed at the expense of the texture, in the latter the fat is merely deposited on healthy textures. But a lipoma may produce pressure on adjacent tissue, and thus produce in the part anemia, atrophy, and finally fatty degeneration.

The *diagnosis* of fatty degeneration of internal parts is not aided by any known positive signs or reliable symptoms, and cannot, therefore, in the present state of science, be positively determined upon in the living subject. The treatment, when its presence is sufficiently probable, should be directed on general principles. All hydro-carbons should be withheld, and a proper balance of the nutritive forces should, if possible, be restored.

Pigmentary Degeneration.—Pigment is a carbonaceous substance closely allied to fat. It is a normal constituent of the rete nucosum, or lowest layer of the cuticle. It is more abundant in the dark than in the fair races, and it may present any shade of color owing in a measure to solar influences, but more especially to hereditary transmission; hence the various colors of the races. In the negro, the pigment is black, and is therefore denominated *"pigmentum nigrum."* The quantity of pigment may become much reduced, or that which was dark may change to a light color, under some morbid influence connected with the processes

of nutrition and absorption, and this explains the wonderful and rare phenomenon of a *negro turning white.*

The pigment is liable to degeneration and various changes in quantity, as results of causes similar to those which produce like changes in fat, to which it is closely allied in its chemical constitution. But its most obvious changes are those to which the fats present no similarity, to-wit: the various shades of color, as black, brown and yellow, which it is liable to present under certain morbid influences. These changes appear to be chemical, and to be produced by alterations in the hematin of the blood. As remedial measures, the deductions derived from the foregoing considerations suggest the avoidance of carbonaceous ingesta, and enjoin nourishing food, moderate exercise, frequent ablutions of the skin with cold or tepid water, tonic medicines, and a temperate climate.

Mineral Degeneration implies the deposition of mineral substances in any of the soft textures. It differs from the concretions in this, that the intruding material is not deposited in an accumulative mass, but is diffused through the tissues, imparting to them hardness and brittleness; so that when this lesion affects the heart or large arteries, it exposes them to the danger of fatal rupture. Every texture in the system is liable to this abnormity, and is most likely to occur in connection with fatty degeneration.

Plethora, or *General Hyperemia.*—Increase of the amount of blood generally, and of the red corpuscles specially, above the normal standard, constitutes this element of disease. It is not of frequent occurence nor of much importance, except in rare instances, when it gives rise to internal hemorrhage; or when the texture of an organ or part is excited by a local irritant, either mechanical or chemical, or by the over-abundance of oxygen carried by the red corpuscles, the blood forms a nidus in the irritated texture, and thus we may have active congestion—a formidable element of disease, to the consideration of which the succeeding chapter will be devoted.

The *causes* of general hyperemia are free indulgence in nutritious food; breathing a pure air; diminished secretions, and sedentary habits, conjoined with active digestion and assimilation. Plethora in the young, active and robust, is called *active;* when it has existed long, and the muscles have become sluggish, and the superficial vessels are seen dilated and tortuous under the long continued incumbrance of their unnatural onus of blood, it is called *passive.* This is a distinction with a difference that would be as well expressed by the terms *acute* and *chronic,* as they are applied to most affections according to the order of time.

Plethora is well indicated by symptoms and signs. The lips and cheeks are red, the pulse full, and the arteries bounding; the bowels are generally constipated; the secretions are diminished or repressed, and sleep is enjoyed much better than muscular exertion. These latter symptoms are most prominent in the passive variety, or chronic stage.

The treatment of general hyperemia is plainly indicated by the state of the system. Muscular exercise and limited indulgence in alluring viands should be enjoined, and, in addition to these essential measures, occasional cathartics and such other mild depletory measures as are calculated to obviate fullness of habit.

Local Hyperemia.—This is an element of most frequent occurrence, and often of momentus importance. It implies a local congestion, or increased amount of blood in some organ or texture. It is divided into two kinds, or varieties, by a well-marked difference which it is important to distinguish. When the blood that accumulates in a part is arterial, the congestion is active; when the accumulated blood is venous, the congestion is passive. Both of these varieties of congestion will be considered in ample scope further on when we shall have briefly noticed some of the consequences of local excesses of blood and nutrition. In direct antagonism to anemia, atrophy, and the various morbid degenerations of texture, do we often find hyperemia, hypertrophy,

and the various morbid growths. Any mechanical irritation or other influence capable of causing an accumulation of blood in any part may give rise to local hyperemia, and this in turn induces hyper-nutrition, and hypertrophy, and this latter may be but an augmentation of the normal texture of the part, or the newly formed structure may be unlike any of the normal textures of the body; and in view of this difference morbid growths have been divided into two classes, and denominated respectively *homologous and heterologous.*

It is not to be inferred that every hyperemia ultimates in a morbid growth, nor that those growths can originate in no other way; but that a majority of them have their origin in a local hyperemia, and that all are developed by nutrition from the blood. These propositions, we think, are sustained by the most positive teachings of pathology. It is certain, too, that diathesis and cachexia influence the origin and character of morbid growths, and these constitutional causes usually fix the location of the growth. Thus, where there is a rheumatic diathesis, osseous growths appear as if by preference at the extremities of long bones; but if the cachexia is syphilitic, nodes and oxostoses appear as constantly at the continuity of the bone, and, under the influence of the same constitutional taint, epithelioma is generated and its site fixed on or about the genitals. Morbid growths usually partake more or less of the nature of the textures in which they grow.

Some ingenious reasoning has been presented by Prof. Bennett, by which he is led to conclude, that, unlike a primordial cell, the molecule, or the infiltrated cell from which a morbid growth springs, is not impressed with any definite type or character by which its future development is in any way influenced; but when considered in view of the laws governing development generally, the proposition appears rather more than doubtful. It is true that every development is modified by attendant circumstances and

influences in various ways, and it is thus that abnormal textures and organisms are developed; but the process by which they are developed is natural, and the abnormity is a natural result of all the circumstances and influences under which it is formed. But a parent cell directs the results of its development as well as interposing influences; so that, as regards morbid growths, *benign* and *malign* often express a generic difference between them that was as real in the cells from which they were developed as it is obvious between a wen and a cancer. Almost any benign growth may become malign; but a malignant growth—a carcinoma, for instance —becomes benign never.

Morbid growths, then, are properly divided into the two species, *Benignant* and *Malignant;* but one of these moves insensibly into the other by a series of descending degrees inversely to the progressive gradation in the scale of organization from the plant to the animal, or from the monkey to the man. So tumors present every grade of character, from the simplest serous cyst to the most malignant carcinoma. Cachemia tends to develop cancer, in the prone; local lesion acts as an exciting cause; hence, malignant disease of the womb is rarely seen except in women having both a cachexia and an old laceration or ulceration of the cervix.

A benign growth, so long as it maintains its generic character, can do no harm, except as a parasite, or as a nuisance in consequence of its bulk, weight and pressure. But not so of the malignant tumor; it is prone to the destruction of texture, and its encroachment is often rapid and irresistible: besides, it is but a local manifestation of a general cacæmia, and if this condition of the blood did not preëxist, it is rapidly induced by the molecules generated in the fluid of the morbid growth during its development, and it is therefore generally recurrent.

Between these two species of tumor, the differential diagnosis is facilitated by observing the characteristics peculiar to each of them. The benign tumor is developed slowly and

without constitutional disturbance; and if it is superficial, it moves readily from its place by the slightest manipulation, and the line of demarkation between it and the normal textures is well shown. On the other hand, the malign growth is likely to be developed rapidly; to palpation it imparts a sensation of doughy firmness; the skin and subcutaneous tissues appear to be firmly attached to its superficies, so that it is not readily moved from its place. No obvious line of demarkation shows where it ceases and the normal textures begin, and there is sooner or later constitutional disturbance, of which one of the earliest evidences is manifested by swelling of the glands in the axilla or groin.

Remedial Measures.—The treatment of morbid growths belongs mainly to the domain of surgery. If the nourishment of a tumor can be suspended by depriving it of blood, it is well; with this view, pressure, cold, and the ligature, have each in turn been applied, and the latter at least often with success. But the means usually resorted to for the extirpation of morbid growths are chemical agents and the knife. An efficient application is formed of chloride of zinc one part, wheat flour three parts, with a sufficiency of water to form a paste. A surgeon should not hesitate to remove a benign tumor at once, either with the knife or other efficient means. As regards those which are manifestly malignant, the attendant circumstances in each individual case are to the wise practitioner the surest counselors. It is but just to state here, that in many instances malignant tumors never recur after their removal.

There is one other effect sometimes produced upon the textures by excess of blood in a part, or local hyperemia, which we wish to notice *en passant*, to-wit: softening of the brain and spinal cord, and breaking up of their cells and nerve tubes. We noticed this condition as a result of anemia when treating of that element and its consequences, but this lesion, *mollities cerebri et medullæ spinalis*, occurs much moer frequently as a result of active congestion, and as the conse-

quence of mechanical injury to those textures produced by the extravasation of blood.

It is very difficult to arrive at certitude in the diagnosis of this or any other lesion of the brain or spinal cord. The symptoms and fatality of lesions of nerve centers vary greatly according to the special region involved. Thus, lesion of the anterior columns of the spinal cord, involving the grey matter and a motor root of nerves, gives rise to paralysis of voluntary motion; and a similar lesion of the posterior columns destroys sensation. Softening of the medulla oblongata never occurs, because this center is so essential to respiration, that when it suffers lesion death contravenes all successive stages. Softening of the pons varolii produces convulsions and paralysis. This, or any other lesion of the textures about the center or base of the brain contravenes locomotion and the motor powers generally, while a similar lesion of either of the cerebral hemispheres disorders the mental faculties or dethrones reason.

Sometimes softenings or other lesions occur coincidently in two or more regions of the brain, or of the cerebro-spinal axis, thus grouping together many contradictory symptoms in such confusion and contrariety as are well calculated to baffle the unguarded practitioner out of a correct diagnosis.

Softening of any portion of the nervous texture gives rise to a train of symptoms very like those produced by the extravasated blood in the same locality, so that the exercise of a fine discrimination is required in making the differential diagnosis. The loss of sensation or motion comes on suddenly when it is caused by a clot of blood in the texture of the brain or cord. Such attacks are never preceded by premonitory symptoms except when the hemorrhage depends upon the softening and rupture of a vessel. On the other hand, when softening is the *ipse morbus*, the mania or the paralytic attack is almost invariably preceded by premonitory symptoms, such as loss of memory, ringing in the ears, diminished sensibility, or defective mobility, till finally

either spasms, paralysis, dementia, or this whole trio, appear and establish their coming.

Passive Congestion—Results—Remedies.—Venous congestion is caused by obstruction to the return of the blood to the heart, by which the capillaries emptying themselves into the obstructed vein become distended and engorged with blood. This blood being in a high carbonaceous state cannot generate inflammation, but may as a legitimate result induce passive hemorrhage by the effusion of the detained blood, or the serous portion may be effused into some of the excretory canals—*Flux;* or the effusion may be into the intercellular tissue, or into some of the shut sacks—*Dropsy.* In this way cardiac and renal dropsies have their origin, in consequence of obstruction in the valves of the heart in the former, and of the emulgent veins in the latter. Obstruction in the portal or hepatic veins, or thickening of Glisson's capsules, will cause passive congestion of the abdominal viscera, and consequent dropsy of the peritoneum—*Ascites.*

Pulmonary disease in some of its forms, as emphysema, may render the expiratory act distressingly laborious, and thus give rise to congestion by opposing the return of blood through the veins, also by partially counteracting that suction influence which invites the blood into the pulmonary capillaries at each inspiration. The veins being more superficially seated than the arteries, will more readily contract under the influence of external cold; the volume of blood which they return to the heart being diminished, congestion of the viscera and deep-seated tissues will ensue; one or more of the most active emunctories thus suffering congestion at the same time, with consequent inactivity of secretory function, foreign materials are retained in the system which are *per se* elements of disease.

Tubercular deposits in the lungs favor venous congestion in those organs, evincing the protective power of nature in supplying the diseased part with carbonaceous blood, which is antagonistic to tubercle.

Congestion may arise from atony of the vessels, as in the zymotic fevers, and in the sinking which precedes death; the heart in its enfeebled condition is not able to propel the blood in due supplies to the extremeties; but the force of the heart is not only enfeebled, but impeded by the relaxed parieties of the vessels. The veins and capillaries being sparingly supplied with tonic contractile fibres, are more susceptible to the congestive influence, also parenchymatous structures. Owing to the relaxed parieties of the vessels the blood follows the law of gravitation, distending those vessels, and congesting those parts most which are lowermost—*Hypostatic Congestion.* It is seen in the posterior regions of the bowels, lungs, and brain, of debilitated patients, who have long maintained the dorsal decubitus. Long standing or sitting may produce engorgement of the hemorrhoidal veins and of the uterus in feeble women.

Dropsical effusions vary in quality with the state of the vessels and the blood from which they are effused; if the parieties of the vessels are lax and the blood impoverished and hydremic, the effusion will be decidedly serous; if the walls of the vessels offer more resistance to the exosmotic influence, and if the blood contains nearer its normal amount of protein constituents, the effusion will be more albuminous.

In some forms of debility, as chlorosis, in which the corpuscles only are diminished, there is no dropsical effusion. When dropsical effusions depend upon organic lesion of the heart or kidneys, or occlusion of a vessel produced by the pressure of aneurismal or other tumors; to evacuate the effusion would only be as bailing a sinking ship, while its shattered hull is still drinking in the inexhaustible tide. But in dropsical effusion depending upon atony of the vessels and a hydremic state of the blood, eliminating medicines followed by tonics afford the most rational treatment. Nor in the former cases should eliminants be withheld, as their effect is palliative. Eliminants act by being absorbed into the blood, and passing through the secernent organs augment

their secretory action; but some of the emunctories have peculiar affinities (if I may so speak) for particular eliminating agents. Thus, the kidneys are specially influenced by the terebinths; the intestinal glands by elaterium, etc. Mercury is peculiarly directed to the liver, but it sensibly increases the secretory action of the entire glandular system. Reasoning, *a priori*, I would suggest that mercury thrown into a torpid secretory system, and failing to arouse its action, would very readily salivate.

To three of the most active emunctories is confided the office of eliminating from the system the three principal organic elements, viz., carbon, hydrogen, and nitrogen; the lungs mainly exhale the carbon, the liver elaborates fat and sugar from the hydro-carbons, and the kidneys take out the nitrogen; the skin and intestinal glands are effective coadjutors.

In selecting emunctories for the elimination of dropsical effusions, we should demand most of the organs which in that particular case have the most ability to perform; but not "work one organ down" by addressing all our treatment to it.

Particularly I demur to the practice of goading congested kidneys with stimulating diuretics; and, for similar obvious reasons, reprehend the practice of irritating an inflamed liver with cholagogues.

CHAPTER VII.

ACTIVE CONGESTION—RESULTS—REMEDIES.

Active congestion is the most important element of disease. Physiological determinations of the blood are common, and are even necessary for the healthy action of various organs, as the brain in thought, the uterus in gestation; but no physiologist will say that these are diseased or abnormal actions—as the brain is the throne of reason, and the uterus is the chamber of gestation. There is, then, no hiatus between these normal actions and active congestion in its literal and proper acceptation—a local hyperemia supervening upon some offending irritant—an element of disease varied in its phenomena and unfriendly in its results—*inflammation.* I use the term "active congestion" as synonymous with inflammation, and in preference, because it conveys a definite idea—it is expressive of itself—it is the prime element of all the results of inflammation—it is inflammation *per se;*—while, on the other hand, the term "inflammation" is indefinite, is vague, and is the nucleus of confusion.

Learned authorities have said that inflammation is active congestion with effusion. This appears to be as erroneous as the old definition of disease, which included with it the symptoms which it produces. It has been further asserted, and Prof. Bennett, of Edinburgh, particularly insists, that inflammation is exudation of the *liquor sanguinis;* that is to say, inflammation is *not* inflammation till it reaches that degree of intensity which produces exudation.

Active congestion may occur in some part, as the conjunctiva; the capillaries are distended with arterial blood; oxygenation is active, but there is no exudation—the inflammation has not yet attained a sufficient degree to produce it; the protein constituent of the blood has not been oxydized and converted from a protoxide to a deutoxide and thrown out as an exudation: yet it is inflammation, and if it be allowed to proceed, it may go through its several grades and effect its various results, as exudation, suppuration, ulceration, etc. To assert the contrary, would be as arbitrary as to say that a child is not a human being. According to such fallacy, a burning mountain contains no fire unless it is throwing out the products of combustion; but if lava be upheaved, the oxydation which produces it is of no importance, but the lava is a *volcano*. Again, epilepsy would not be epilepsy even when the *petit mal* is present. Wonder if it would be epilepsy when the *grand mal* comes like the thunderbolt of Jove!

Dr. Bennett is deserving of great respect for his learning and for the many sensible things which he has written; but his ideas of active congestion appear to be defective. They may be supported by some strange law governing the animal economy in Scotland; but exudation is a product of inflammation in America.

The *causes* which lead to active congestion are varied and numerous. They may be general or local, mechanical, chemical, or vital—anything capable of producing irritation or interrupting the circulation of oxygenized blood. Intense and long continued cold, violence, the application of vesicants, are common and familiar causes; or the offending irritant may be produced or introduced into the blood—as the animal poisons in the blood (*zymosis*) and the *materies morbi* of typhoid fever often irritate some of the delicate structures. Thus, the glands of Peyer rarely escape congestion, and often suffer ulceration, while they are industriously eliminating that irritating material from the blood. I believe that the

frequent supervention of pneumonia upon typhoid fever is referable to this cause. Again, the frequent occurrence of dysentery, when the spleen is large and congested, is perhaps referable to obstruction of the flow of the blood through the splenic artery.

All eruptions upon the skin are so many congestions produced by irritants in the blood. The dark red spots which sometimes appear on various portions of the skin, after the use of iodine, are characteristic. Infants very commonly have some kind of a rash, because their skin is so delicate that the least irritant in the blood irritates it.

Whatever cause may influence active congestion, the first impression produced on the capillaries is contraction of their walls; their power of contractility depends upon fusiform cells (Lister), which possess elements closely allied to the fibres of the involuntary muscles. These cells may be temporarily influenced by impressions made through the nervous system; this is illustrated in the color of the face when sudden impressions are made on the mind. This, however, can only be momentary. The preliminary contractions even in the presence of an irritant, cannot continue long until those contractile cells become exhausted. They are now feeble and are densly crowded with blood fresh from the lungs, with its red corpuscles loaded with oxygen. Now commences the oxygenation of the nutritive lymph; and this process so far controls the phenomena and results of active congestion, that some eminent authorities have said that inflammation is oxydation, and with much more plausible reasoning, too, than has been produced to prove that it is *exudation*.

The first product of active congestion is serum; then liquor sanguinis, adhesion, suppuration, hemorrhage, ulceration and gangrene. Active congestion may disperse before it produces any of these results; or it may proceed till it has produced one, two, three, or even all of them. The serum first effused will be absorbed if the congestion be early

discussed; but if the serum be succeeded by liquor sanguinis of sufficient vitality, molecular blastema are constituted (Bennett), in which cell-growth is established. I believe if these cells develop precociously, they soon perish as pus; but if favored with longevity and conducive circumstances, they partake largely of fibrin, become plastic, and form false membranes and adhesions. But the exudation may be of low form, and incapable of organization or vital activity. In this way tubercles are perhaps formed; or it may be dissolved and absorbed, resulting in resolution. There may be gradual disintegration of the tissue without being compensated with plastic material—deficient nutrition of the part; this is ulceration. Finally, the exudation may be vitiated by constitutional taint or atmospheric contaminations, or in some way changed by chemical action, so as to give rise to gangrene and all the degrees of mortification. Hemorrhage is liable to occur at any time of the entire process. I have observed that in gun-shot wounds it is most liable to occur as late as twenty or twenty-five days after the injury is received, but may occur sooner or later than this.

The *symptoms* of active congestion are numerous; they vary with the degree of congestion, with the length of time it has existed, and particularly with the kind of tissue in which it is situated. Heat, pain, redness and swelling are the symptoms and signs upon which this disease is usually diagnosed: they are direct consequences of the congestion, and are of necessity usually present as a group or in part; but these are ever varying, and each kind of tissue has its peculiar structure and its characteristic pain: thus parenchymatous structure, as the lungs give but little pain, because the effusions have sufficient room, and are not impacted against the nerve fibres. The converse is true of the serous, synovial and fibrous tissues: here the tissues are dense, and the pain is acute and intense. Therefore, if the dull pain of pneumonia is unfelt in consequence of violent, lancinating pain in tne chest, we rationally refer the latter to the pleura.

The pain of dermal tissue is a burning sensation, as in erysipelas. On a line where the skin unites with the mucous membrane pain is intense and annoying, as a furuncle about the external nares, or a hordeolum on the margin of the eyelid. The pain is sometimes referred to a part far distant from the site of inflammation, as from the hip to the knee, from the bladder to the testes, from the urethra to the instep.

Lastly, this symptom may be absent even in acute inflammation; it is often absent when the disease is chronic.

Hyper-esthesia—excessive sensibility, or tenderness to the touch—is eminently diagnostic of inflammation. It is nearly allied to pain, and is even more characteristic. In some instances it is the main evidence upon which we determine the existence and location of inflammation. Pressure in the right illiac region is our surest means of determining the condition of Peyer's glands in typhoid fever. We often resort to palpation of the *os uteri* in order to determine its condition by the presence or absence of tenderness.

Heat is generally present, because there is more than a normal supply of arterial blood, attended with active oxydation in the part. It is lost to us as a symptom or sign when the inflammation is seated within the thoracic or the ventral cavity. When it is situated near the surface, often heat can not be felt because of intervening exudations.

Redness when present is some aid in diagnosis, but it is often absent, and is of but little value, because the color of inflammed surfaces is so far modified by the varieties of structure and by the stage to which the disease has attained.

The swelling depends upon the hyperemia, and is augmented in proportion to the quantity of effusion produced and poured into the involved and adjacent tissues, and the capabilities of these tissues to receive it. Thus cellular tissues, as the eyelids and their adjacent structures, become much swollen from slight causes; while the denser structures, as the tendons and the serous membranes, are too impervious to receive the effused fluids, and therefore never

become swollen to a great degree. Finally, the functions of the parts involved are impaired or suspended. Motion is painful, sometimes too intolerable to be borne; heightened sensibility remains until cicatrization is complete.

Fever is chief of the constitutional symptoms; its grade is dynamic, its type is continued; but it always abates with the local changes upon which it depends. The abatement of the fever is often the first tangible evidence we have of the resolution of an acute inflammation; hence the fever is eminently prognostic. On the other hand, it is highly diagnostic when shivering is succeeded by hot skin, bounding arteries, and accelerated circulation, with diminished secretions; and if this state continue forty hours or longer without intermission or remission, we confidently predicate the existence of active congestion of some organ or tissue of the organism. Its precise locality is determined by intelligently applying to our senses all the symptoms and signs heretofore mentioned.

This essay being designed with a view to brevity, I have not space to mention here the various other means of knowledge to be brought to bear in making a correct diagnosis. It may suffice to say, that the normal structure and physiological functions of the various organs should be compared with their present condition. With all the known means, it is pretty easy to determine the location of this morbific element. The state of the pulse is indicative; the difference is obvious between the full, resisting pulse of pneumonia and the accelerated, small and compressible pulse of enteritis. The fever appears to depend upon the increase of lymph globules—coagulated lymph—deutoxyd of protein,—which stimulates the heart to accelerated action. This view has been sustained by Prof. Linton, in whose learning and contributions to science every American has cause for just pride. Then there is increased oxygenation, which doubles the amount of oxygen in the protein constituents of the blood, which now becomes an irritant and stimulates the

heart to energetic activity. The pulse is accelerated—there is fever—excitement and discord prevail—the nutritive element is out of balance—each of the various organs and tissues of the organism (as the people of a city are to the market) is dependent upon this nutritive element for the material to supply their various wants and to compensate for their continual disintegration. But the current is frantic—there is no regular supply—there may be over-abundance of blood in one part and famine in another; some of these integral citizens get too much of what they want, others get what they don't want, others perhaps get *nil*. Meantime the rapid transit of the blood through the secreting organs prevents them from taking out of it those effete materials which are damaging to the system. These materials are on their way to the vast expanse of the inorganic kingdom to become a part of the inorganic world, or to enter into new relations and again form a part of an animal or an humble plant. But there is no exit—the doors are closed—the secretions are locked.

May I be pardoned for being tempted, for a moment, into this inviting Eden. But what more for this general disturbance? There is excitability and great restlessness; pains and aches come up from different parts. The irritant in the blood will explain some of these; the very indefinite term "sympathy" is often used to explain some of these pains and other phenomena not readily accounted for. What then is their true rationale? It is the existing lesion of nutrition—this irregular supply of the nutritive material to the demands of the various parts.

So much for the phenomena of symptomatic fever; but it has other concomitants. It is apt to be ushered in with a cold surface and shivering: this indicates the contraction of the capillary system, which we noticed as being precedent to a local hyperemia. Here all the superficial capillaries contract at once, as if by instinct they were fortifying against the gushing torrents of the approaching pyrexia.

The *varieties* of active congestion are as numerous as the degrees to which it may attain, the causes that may produce it, and the constitutional predispositions and the circumstances surrounding the individual in whom it may occur. Thus, it is acute if it runs a rapid course; if it continues three or four weeks, it is sub-acute; when it continues longer than this, and does not tend to an early recovery, it is *chronic;* if it attacks the robust and plethoric, it is *sthenic;* if it attacks those who are weak and anemic, it is not apt to produce so much constitutional disturbance—this is the *asthenic* variety.

Again, inflammation is divided into two grand varieties—*common* and *specific.* This distinction is of much practical importance; it is always desirable to make a proper discrimination betwen them. Common inflammation is that which occurs from ordinary causes, and is not modified by constitutional taint or specific virus; for this reason it is the more amenable to treatment. The specific variety is that which depends on specific causes; of this variety are all the zymotic diseases, such as Malignant Pustule, Syphilis, Frambesia, Variola, Glanders, Scarlatina, etc. Indeed, the catalogue of specific inflammations is too long to be mentioned in full here. Some of these specific diseases which have been introduced into the system by animal poisons, as syphilis, and many that are not so introduced, as gout, often exist long in the system in a latent state, forming what we call a *diathesis;* hence we speak of the syphilitic, the rheumatic, the erysipelatous, and the strumous diatheses.

The prime element in most of the above forms of specific disease, is germ or baccillus, variable in kind and character.

If inflammation be produced by any cause, whether idiopathic or traumatic, in a system where one of these diatheses is present, it will act in concert with, and bestow its own type and peculiar phenomena upon, the new malady. Each specific element produces results peculiar to itself: thus, if you inoculate two individuals, one with an atom of syphilitic

virus, the other with a globule of pus from a small-pox pustule, you get specific results; each produces its kind. But if the two species of virus be inoculated in the same person, the result will be small-pox and syphilis, but there will be a blending together; each one will be modified by the other, as in idiopathic disease, modified by a diatheses, and *vice versa*. This law governs vegetable life as well. If the seeds of a melon and a pumpkin be planted in close proximity, their products will be blended together; each will partake of the nature and qualities of the other. These phenomena harmonize with the great fundamental truth, that an organism, whether an animal, a plant, or a primordial cell, is not in a state of isolation, but is intimately connected with the whole organic series. The blending of a higher with a lower organization may favorably modify the latter at the expense of degeneracy to the better organization.

Observations.—The varieties and modifications of this morbific process are too multifarious to be enumerated. In some variety, form, or degree, it either complicates or forms the prime element of *almost* every ill incident to the human race. It is not the fabled club of Habib, but it is the bane of our mortality. It is with this that we have most to do, most to suffer, and of this, albeit, we shall most all perish! This element includes within its wide range very nearly all diseases—most all with which fatality is connected at any rate. He who traces it through all its varieties and modifications, and writes a faithful elucidation, demonstrable in the light of science, of all its varied phenomena, will contribute to the profession the best work ever written on the subject of medicine. *Volo, non valeo.*

Treatment.—Manifold are the indications liable to be presented by a malady so varied in its causes, its site, and in its complications.

The writer believes that the couch of the sufferer is the proper place to perceive the indications and consider the treatment of all diseases. The principles of general treat-

ment may be given here. The first indications are such means as are calculated to discuss or diminish the local hyperemia. This may be done by cold applications and revulsives. Sometimes the local abstraction of blood by cups or leeches is serviceable. Elevate the affected part so that gravitation will retard the flow of blood through the arteries leading to the congested part, and facilitate the recession of blood through the veins. If the brain is the suffering organ, active and free purgation is urgently demanded; its *modus operandi* is mainly revulsive. But purgation is neither so effective nor so well borne if the disease is seated in the lungs. Free purgation is not admissible in enteritis. Warm fomentations should be applied over the chest or bowels when active congestion is seated in any of the viscera of these cavities. This application is peculiarly useful in relieving the pain of enteritis, peritonitis, pleuritis, nor is it less serviceable in relieving the pain and dyspnea of pneumonia; it relaxes the small tubes and allows a free ingress of air; also, by relaxing the walls of the capillaries, their calibre is increased, and the blood which distends them is afforded a more ready exit. Warm fomentations promote the absorption of effused fluids. Further, according to Prof. Bennett, the warmth and moisture which they impart often prevent that chemical decomposition of the exudation which precedes gangrene, and that highly plastic organization which forms fibrinous membranes, by hurrying the exudation to the growth of pus cells which are soon broken down, dissolved, taken into the circulation, and through the emunctories excreted from the system.

Sinapisms are useful appliances over the region of the congested organ. The most effective means of arresting an inflammation, particularly after the stage of excitement has passed, is the fly-blister. If the disease is in the chest or bowels, it should be applied directly over the suffering organ, and should be of ample size. If the disease is situated within the cranium, the blister should be applied to the back

of the neck (not on the head, as in days of yore). If inflammation is in the eye, a blister should not be placed nearer than the temple. In all cases the circulation must be kept in equilibrium. Anodynes may be used to allay pain and morbid vigilance. Patients may generally drink cold water, *ad libitum*. Diet should be sustaining, composed of milk and nutritious soups. Alcoholic stimulants should be administered on the first indication of the vital powers to flag, particularly if the pulse becomes small and frequent, or the body cool and damp. When we were examining inflammation from a pathological standpoint, it must have been perceived that it is a disease of debility, and that the attendant excitement is not an evidence of strength, but of an irritant in the blood and of deranged circulation. Then we should rather foster than diminish the vital power. If, however, the heart's action is excited into a rage, and the blood is moving in the arteries in frenzied torrents, threatening a new nidus for its burning element, or a gushing hemorrhagia, sedatives should be administered. Nauseants and nitrate of potash may not do here; the verat. viride is best adapted to relieve the condition above described, but its use should cease with the inordinate excitement. General blood-letting is an old custom and an old evil. Many confiding patients has the lancet sent to a premature grave. The author never opened a vein to cure or ameliorate disease by the abstraction of blood, and has no reason to regret it. Mercury, used in moderation, appears to be useful in the early stage as a deoxydizing agent. It is particularly useful if the secretory system is torpid, and if the eyes present a muddy tinge, or the skin an icterode hue; but its use should be cautiously limited. Salivation should be avoided; it does no good, but much harm. That mercury promotes the absorption of exudation, or favorably modifies it, is extremely doubtful. Its use for such purposes retards, rather than facilitates, a successful issue. Tartrate of antimony has had its day, and now stands justly condemned. Diuretics and

diaphoretics should be administered, particularly after the stage of excitement has passed. The spirits or oil of terebinth promotes various secretions, and is a special auxiliary to the kidneys in removing from the blood the abundance of effete material resulting from the oxydation and waste of tissue. When the disease is chronic, depletants should be particularly abstained from. The system should be sustained by tonics, stimulants and nourishing diet. Counter irritation is especially useful here as in the acute stage. The diathesis or the cachexia, if any, should be considered in directing treatment. Whatever may have caused the inflammation, if the diathesis is strumous, prescribe iodine, the iodides, fresh milk, and cod liver oil. If the cachexia is syphilitic, it demands the iodides, burdock, and the ferruginous preparations. If the diathesis is rheumatic, it indicates colchicum and the iodides. Frequent baths or ablutions of the entire surface of the body with tepid or cold water are eminently useful in all these chronic diseases.

Inflammation caused by wounds and injuries has some distinctive characteristics, and demands some special considerations. The lesion of structure produced by a mechanical cause is a source of continued irritation; when produced by a blow or missile, there is much contusion and corresponding waste of tissue. It further differs from idiopathic inflammation of internal organs, in this: that the wound often presents a large external surface which must cicatrize by granulation under the irritation and varying temperature of the atmosphere. In recent wounds, hemorrhage, if it exist, should be arrested; the wound should be thoroughly cleansed of everything foreign or capable of keeping up irritation by free ablution with hot water—carbolized, care being taken to remove all clots of blood, spicula of bone, gun-wadding, etc. The dressing should be very light and unirritating; the best dressing is iodoform, then a piece of clean linen saturated with carbolized water, and applied loosely to the part. If in the suppurative stage the wound is

not kindly disposed; if it is pouring out *ichor*—a thin acid pus—emolient cataplasms are often of service. The wound may be washed with a weak solution of hydro-chloric acid, or of some of the chlorides; the acrid pus must be frequently removed. But if the wound is discharging laudable pus, that is, a thick, white cream-like, non-irritating pus, it should not be disturbed. When removed at all, it should be at long intervals, and with the mildest ablutions. This pus is nature's poultice; under it the plastic exudation is organizing cells for the repair of the lesion—reconstruction is progressing most desirably. It is manifest that the frequent washing of a wound in this condition is not only useless but injurious; it retards the reparative process by destroying the cells or the covering which protects them. Continued destruction to cells, as often as they form *de novo*, may not allow sufficient repair to compensate for the waste of tissue in the part; hence ulceration is a frequent consequence of such procedure.

This brief allusion to wounds is made in the guidance of pathology, and corroborated by the ample observations made by the writer in extensive military hospitals.

CHAPTER VIII.

PATHOLOGICAL CHANGES IN THE PROXIMATE PRINCIPLES OF THE BLOOD.

We now proceed to notice such pathological elements as consist in morbid changes in the proximate principles of the blood. This important organic fluid is composed of red corpuscles, white or colorless corpuscles, fibrin, albumen, combustive matters, saline materials, and water. The blood corpuscles are formed in the spleen and in the lymphatic glands. It appears that these corpuscles, when first formed, are all colorless, and that a majority of cells, after circulating for a brief period as white corpuscles, suffer solution of their walls, when their nuclei are set free and are converted into red corpuscles. These red corpuscles exist in the blood in health in the proportion of 130 parts to the 1,000, and vary in disease from 27 to 180 parts. They exist in some greater proportion in the blood of males than in that of females, and are present in great abundance in fœtal and infantile life.

A red corpuscle consists of a delicate covering or sac, containing two peculiar chemical principles in a fluid state, known as globulin and hæmatin. The globulin is in much the greater proportion, and is almost pure albumen; the hæmatin contains largely of iron, phosphorus and potash, and appears to give to the globule its peculiar red color. A knowledge of the component elements of these corpuscles explains why it is that a due proportion are so essential to the nutritive process; and as they are carriers of oxygen

from the lungs to all parts of the system, they appear to be the element of the blood upon which all the energies of life mainly depend.

The red corpuscles may be increased, diminished or altered in their condition or composition. When their proportion is increased to any considerable degree, their vivifying influence, consequent mainly on the abundance of oxygen which they carry, stimulates the heart, and, indeed, all the organs of the system, to increased energy; so that there is increase of animal heat and exaltation of all the functions of life. This condition may be produced by excessive indulgence in rich food, combined with such measures as promote the processes of digestion and assimilation, and its presence is indicated by florid lips, blushing cheeks, and excited functional activity.

The red corpuscles are diminished by deficiency of food, exposure to impure air, and by all influences capable of producing digestive derangement; also by over-exertion, and by hemorrhage and other exhausting drains from the system. This principle of the blood is diminished either primarily or secondarily in all affections attended with debility or exhaustion of physical power, as typhoid fever and in all the grades of continued fever, in chlorosis, tuberculosis, scorbutus, and suppurating wounds. The long continued action of mercury, lead, antimony, or colchicum, upon the system rapidly destroys the red corpuscles and retards their formation. The signs of deficiency of this element of the blood are but the familiar signs of anemia: the skin is blanched or sallow, the lips pallid, and the muscles flaccid and deficient in power.

Change in the state or quality of these corpuscles is a prolific element of disease. These qualitative changes in the red corpuscles give character to some of the most grave forms of continued fever. In the malignant grades of typhoid fever, there is breaking down or solution of these corpuscles, and their coloring matter (hæmatin) is lodged in patches in

the subcutaneous tissue, or it paints the *cutis vera* in spots. Hence, we find upon the skin the rose-colored spots, the purple petecchiæ, and the vibices with their long, dark stripes resembling ecchymoma, thus presenting the various shades of color that the coloring matter of the corpuscles undergoes under some peculiar morbific influences.

A grade of continued fever of the typhoid type occasionally prevails in some of the Western States. It is characterized by an unusual abundance of rose-colored spots, and has therefore been erroneously denominated "spotted fever." Some practitioners have observed some isolated cases in which the brain or spinal cord suffered as a natural consequence, but perhaps to an unusual degree, and hence the name cerebro-spinal meningitis has been applied to this essential fever in some circles. In those cachetic conditions of the system common to the advanced stages of scorbutus and syphilis, the cachemia appears to consist in diminution of the red corpuscles, and perversion of their constituent principles, and in the latter affection the blight is the effect of a septic poison in the blood. But in both of the last mentioned affections we find upon the skin, respectively, the dark and the copper-colored spots characteristic of the morbid solution of the red corpuscles of the blood. Blood that has long existed in a state of stasis in any part of the body, as in chronic congestion of some organ, becomes deteriorated or "spoiled," and as it is received back into the circulation it contaminates the whole volume of blood. This corrupting *touch* is particularly destructive to the red corpuscles. Observe the familiar instances of congestion of the womb unrelieved by the wonted catamenial flow, and the attendant chlorosis consequent on the contamination and destruction of the red corpuscles by the blighting influence of blood that has remained long at rest in the minute uterine vessels.

All malarious districts furnish examples of enlargement and congestion of the spleen, and consequent vitiation of the blood, which diminishes the proportion of red corpuscles,

both by the destruction of many of those already formed, and by rendering the white corpuscles incapable of undergoing the metamorphosis necessary to their generation. This disproportion between the white and the red corpuscles of the blood is consequent on long continued congestion of any of the textures of the system, but it is greatest and most remarkable when it is the result of congestion of the spleen, or other organs or bodies denominated lymphatic glands, for the reason that these are evidently the organs in which the colorless corpuscles are formed. The state of the system above described in which the white corpuscles are largely increased at the expense of the red ones, has been denominated *leucocythemia.*

Granular disease or other lesions of the kidneys altering their secretory function, and causing a profuse drain of albumen from the blood, diminishes the red corpuscles by depriving them of albumen, which is their natural protection. In jaundice these corpuscles suffer diminution evidently in consequence of the presence of bile in the blood. It is manifest that whatever influences contaminate or diminish the red corpuscles of the blood, produce oligæmia and cachemia.

The red corpuscles are living cells; each one is a complete organism, each has alloted to it a definite period of existence, or a natural life-time; subject, however, as we have seen, to the deleterious influences of morbific agencies. Much curiosity prevails to know in what organ of the system, or on what portion of their journey, these *little pilgrims* meet their death, and what disposition is made of them at the close of their brief career; for it is a curious fact, that in a living human body millions of them die every minute. Some eminent authorities maintain that they are all destroyed in the liver, while others assert that their final destruction takes place in the spleen, and there are yet others who affirm that they suffer dissolution as they travel the rounds of the circulation; and it does appear most probable that they are dissolved in the fluid in which they circulate,

and are converted into fibrin, or separated from the blood in its passage through the liver, and afterwards appear as a constituent part of the bile.

The Treatment of excess of red corpuscles in the blood requires but a brief notice here. In this comparatively feeble and *disease-stricken* generation, this state of the system is of so rare occurrence that it seldom requires a resort to prophylactics or to the aid of the physician. When these corpuscles become so abundant as to be incompatible with health, it becomes necessary to diminish them by retarding their formation; and in order to this, efficient agencies are numerous. Low diet and occasional purgatives are usually sufficient as medical agents. Blood-letting, mercury and antimony destroy the red corpuscles rapidly, but it is obvious that their effects would be worse than the disease.

Deficiency of red corpuscles is an important element of disease, mainly in consequence of the great frequency of its occurrence, as it presents itself primarily or secondarily in every affection that is attended with considerable severity.

Remedial measures readily suggest themselves, and act in a comprehensive manner: moderate exercise in, or exposure to, a pure, bracing atmosphere; free indulgence in the use of food rich in nutritive material; the moderate use of pure wine or brandy; the bitter tonics and mineral acids; and, above all, iron in some soluble form. Any preparation of iron should be taken soon after a meal, so that it may mingle with the aliment in the stomach while it is undergoing digestion, in consequence of which it will be more readily assimilated to the blood.

The qualitative changes in the red corpuscles, heretofore noticed as constituting grave elements in some malignant febrile affections and other cachetic conditions of the system, require such therapeutic interference as is calculated to cleanse the system and rid the blood of the diseased and decaying corpuscles, and to promote the formation of healthy cells to compensate for the loss sustained. In order to

accomplish these objects, the skin, kidneys, and all the emunctories, should be kept in the active exercise of their respective functions, and the bowels should be encouraged to as active operations as the system is well able to bear; always, however, avoiding frequent alvine evacuations, and all other debilitating measures, when the tendency is to prostration. Where the slightest tendency exists to the latter condition, the skin and kidneys may yet be kept active, but the bowels should be restrained to a merely soluble condition. Tonics, stimulants and nutritives should be administered, and a sustaining treatment should be observed throughout.

Fibrin.—This substance is nearly allied to albumen, and exists in the chyle, lymph and blood; in healthy blood it is present in the proportion of about 3 parts in every 1,000. Fibrin, like albumen, has a protein nucleus, and may exist in a soluble or insoluble state. It is richer in nitrogen than albumen, and it also contains one chemical equivalent more oxygen, and is therefore a deutoxyd of protein; but its distinguishing characteristic is its tendency to organize, which gives to the blood the property of coagulability. Its coagulation is the agglutination of fibrils which form meshes, in which the cells are entangled and arrested, thus augmenting the accumulation till a clot is formed.

When the fibrin coagulates without receiving the cells in its meshes, as when they sink down in the vessel below the fibrin, the clot of course does not present its usual red color, but a brown or buffy hue, and has therefore been called the "buffy coat"; and, in the absence of cells, the fibrils meet with less resistance and contract to a greater degree, so that the edges of the clot or coagulum become raised, forming a basin-like concavity. The important practical deductions to be derived from these considerations will be most apparent when contrasted with the doctrine formerly held, that the buffy coat is pathognomonic of inflammation, and thus the lancet was wielded with remarkably fatal consequences.

Fibrin exists in greater quantity in arterial than in venous blood. It furnishes material for the formation, growth and repair of certain tissues; it acts as a shield of protection to the red corpuscles in the circulating current, and it obviates the tendency to effusion of blood and serum through the walls of the vessels and from the capillaries, and retards and limits the flow of blood when it escapes through accidental openings in the vessels.

Increase of fibrin is a natural result of hyper-oxygenation, and accordingly we find it in excess in most all of the inflammatory affections, and especially in those of the sthenic variety. Inflammation appears to give rise to the greatest amount of fibrin when it occurs in fibrinous textures, as in the periosteum, muscles and sero-fibrous membranes. This view is supported by the fact that the greatest excess of fibrin is found in the blood of persons suffering with acute rheumatism, which especially involves these textures.

Fibrin is generally in excess in phthisis pulmonalis, evidently in consequence of inflammatory results and complications. It is said to be in excess in anemia, though this is rather relative than real. It is an important fact that the fibrin increases during pregnancy, so that at the end of the gestative term it is usually in great excess, while most of the salts are deficient; in this condition the blood is liable to coagulate in the vessels. These considerations explain the fact that a woman just relieved of her *neonatus* and the pang of parturition, upon assuming the erect position, before the nervous and circulatory system are restored to their proper balance, is in danger of the formation of "heart clot"—this is *demotivus lapsus* unheralded.

Deficiency of fibrin is a mutation to which the blood is very liable. As the fibrin is diminished the blood becomes more fluid and less coagulable, so that hemorrhage and dropsical effusions are common consequences of this condition. Wounds and fractures are not readily repaired—the red corpuscles become deteriorated and the nutritive process is retarded.

The fibrin is much diminished, or even totally absent from the blood, in typhoid and other adynamic grades of fever, which accounts for the frequent occurrence of epistaxis, and effusion of blood from the bowels. In purpura hemorrhagica the blood is deficient in fibrin, as also in cholera and in erysipelas. The last named affection is rather exceptional, as being an inflammatory affection in which the blood is deficient in fibrin; here there is not a sufficient amount of this plastic material to form false membrane to cup in or contain the pus that is generated. So this suppurative matter is poured out among the adjacent tissues, and is guided in its travels only by the law of gravitation. It is mainly for this reason just stated that erysipelas, when it reaches the suppurative stage, is obstinate and difficult to control.

Changes in the quality of the fibrin are produced by various circumstances and influences affecting its elaboration and plasticity. Thus, the use of food entirely vegetable, and the neutral and alkaline salts of potash and other alkaline substances, retard the elaboration of fibrin, and diminish its coagulability and its plastic properties. When blood is drawn slowly, it coagulates more rapidly and less firmly than when it flows freely from a large orifice. The coagula of healthy blood are more dense and firm than those of diseased blood. The plasticity of fibrin does not depend upon its quantity, but upon its quality.

This same substance that gives to the blood the power to coagulate, and composes the cup-shaped coagulum, is the lymph or plasma that heals wounds, reconstructs tissues, forms false membranes, and nourishes muscles. When the fibrin is healthy and possesses these plastic properties in a high degree, it is said to be *euplastic;* when the plastic properties are enfeebled by deficiency in its nutritive material, or in its inherent constitution, it is *cacoplastic.* In this condition it is only capable of imperfect or perverted organization, and leads to morbid growths or deposits, which may be of the most fearful character; as cancer and tubercle.

When it is totally incapable of organizing into living tissue, it is *aplastic*. In this state it may form *ichor*, or the aplastic lymph may putrefy and give rise to sloughing of the tissues, or moist gangrene.

Excess of fibrin may be *reduced* by the use of sweet meats, alcoholic drinks, and such other agencies as tend to produce venosity of the blood. Mercury appears to diminish the amount of fibrin in the blood indirectly, by retarding the oxygenation of albumen and other protein principles, thereby hindering its formation. Evidently, if this drug defibrinates, it is because it first deoxydizes. The alkalies and nitrate of potash possess the properties of diminishing or preventing the coagulation and organization of fibrin in drawn blood; but it has been doubted that they diminish the amount or the plasticity of this substance while in the system. Impeded respiration and excessive bodily exercise diminish the fibrin. Blood-letting withdraws the greatest proportion of red corpuscles, and should not be resorted to as a means of reducing the amount of fibrin.

Remedies against deficiency of fibrin.—When the fibrin has been diminished by the presence of a septic poison in the blood, remedial measures should be at once directed with a view to its removal through the emunctories. The food should be rich in nutritive material and taken in as generous supplies as the digestive organs are capable of receiving and appropriating. Tonic medicines should be prescribed and their use persisted in till their effects are evinced by the reinstated crassment of the blood, and renewed strength and vigor of the system.

Remedial measures calculated to improve the state of the blood, as respects the quality of its fibrin, are sometimes indicated. It would be difficult to restore health and plastic properties to aplastic and cacoplastic lymph. These states demand such remedial measures as were directed above for the purpose of increasing the amount of healthy and euplastic fibrin. And in addition to these measures such

agencies are required as are capable of promoting the excretion of the aplastic and cacoplastic materials. For the elimination of these deleterious principles from the system, recourse should be had to diuretics and diaphoretics, of which turpentine, buchu and *spiritus mindereri* are the most eligible. The entire surface of the body should be washed daily with tepid water holding in solution chloride of soda.

Albumen.—This principle exists in healthy blood in the proportion of about 70 to each 1,000 parts. Soda is usually peculiarly associated with it, and is present in the hepatic and splenic veins in the form of a neutral albuminate Albumen, unlike fibrin, is more abundant in venous than in arterial blood; it is the pabulum of the cells and of all the soft tissues, and it gives to the serum a sufficient degree of spissitude to facilitate its motion within the vessels, and to obviate the tendency to hemorrhage and to effusion of the serum by exosmosis, and it protects the cells from the acrimony of the salts.

Excess of albumen is usually present in the acute stage of inflammatory affections, but to a less degree than fibrin. Its relative proportion is increased in cholera and in some forms of oligæmia, as in chlorosis, in consequence of the diminution of serum in the former, and of the red corpuscles in the latter.

Deficiency of albumen is most likely to be induced by insufficiency of nutritive food, conjoined with colliquative discharges or exhausting secretions from the system. In some affections of the kidneys the blood is directly relieved of its albumen by the perverted action of those organs, but albumen is not liable to as varied qualitative changes as the other constituents of the blood.

Remedies capable of reducing the quantity of albumen in the blood, are not often required as such; and this remark applies as well to all the other solid or nutritive principles of that organic fluid. However, such agencies as diminish the quantity or impair the quality of all the protein constituents of the blood are sometimes necessarily enjoined, being posi-

tively indicated to meet some existing, but rarely occurring, emergency. Poor food and excessive bodily exertion are, of course, exhaustive to the albumen and to all the protein principles of the blood. The quantity of albumen in the blood may be *increased* by nutritive food, such as raw eggs, oysters, and rich animal soups, pure air, moderate exercise, and a well regulated condition of the digestive organs and of the processes of digestion, assimilation, nutrition and secretion.

Combustive Materials.—Healthy blood contains an indefinite amount of fat, varying with the quantity and quality of the food, and with the degree of muscular action. It exists in greater quantity in the venous than in the arterial blood, and less in the blood of men than in that of women. The essential animal fats are of three kinds—oleine, margarine and stearine. These all contain largely of unoxydized hydrogen, and are therefore highly combustible, and are capable of evolving an intense degree of heat; but in the animal organism they are oxydized by a gradual process. For this reason, and that they are almost non-conductors of heat, they are important agents in producing and maintaining an equable temperature of the body. It is interesting to observe that the products of their combustion are carbonic acid and water, and that these are the identical binary principles from which they arise.

The quantity of fat in the blood is *increased* by free indulgence in food containing hydrogen and carbon in large proportions, as the flesh and particularly the fat of animals, and vegetables rich in starch and sugar. Sedentary habits and the use of malt liquors favor the production of an excess of fat in the blood, and the consequent development of adipose tissue—obesity.

Excess of fat in the blood may also be produced by inflammation of the liver, or by such obstruction in the lungs as is capable of impeding respiration. Fat is always in excess in the blood when the system is affected with

mercurial salivation. It is an interesting fact that fat finds a receptacle in the system as the nuclei of many cells, and if the food is non-nitrogenized, so that the blood does not furnish a sufficient amount of azotized material to form cell-walls for these fatty nuclei, they are supplied by the muscular fibres, or remain in a free state in the blood. The amount of fat in the blood is diminished by all febrile diseases, by low diet, by most of the vegetable acids, and by all excessive secretions and evacuations.

Sugar is a combustive substance fabricated by the liver out of the hydro-carbons which it receives from the blood. Starch is converted by the pancreatic and intestinal juices into sugar; which is but a stage of its progressive metamorphosis into lactic acid, and ultimately into carbonic acid and water, and these products of its final oxydation are removed by the excreting organs.

Sugar exists in the greatest quantity in the blood of the hepatic vein, on its way to the lungs; and upon reaching its destination, and coming in contact with the oxygen which these organs are constantly receiving, it contributes its combustive elements to the production of animal heat, and does not pass on as sugar, except when it is generated in great excess, as in diabetes.

M. Bernard concludes: that the liver first secretes a substance resembling hydrated starch, called *glucogene*, which upon entering the blood comes in contact with a ferment, and immediately completes the formation of sugar, which upon entering the lungs is decomposed by the oxygen. Therefore, excessive action of the liver tends to increase the amount of sugar formed, and diminution of the quantity of oxygen received by the lungs prevents its decomposition.

For these obvious reasons, diabetes is often associated with phthisis pulmonalis, and other affections of the lungs. These views appear to be substantially approved by such eminent pathologists as Bennett, Carter (of England) and Virchow.

Mineral constituents.—The amount of inorganic matter in healthy blood is equal to a little more than eight parts in a thousand. This estimate does not include iron, which is an important constituent in the red corpuscles. The inorganic constituents of the blood have distinctive characters, and discharge various essential duties. The carbonate of soda confers alkaline properties on the blood; the phosphate of the same base gives to the serum the essential property of holding carbonic acid in solution, and thus it is conveyed from all parts of the system to the lungs to be exhaled.

The phosphate of lime nourishes the bones and other osseous tissues; it enters largely into their structure, and gives to them hardness and friability. When this substance is in excess, as in aged persons, and in those who are excluded from vegetable food, the bones become brittle because of disparity in the proportions of their animal and calcareous constituents. On the other hand, deficiency of this phosphate in the blood leads to softening of the bones, as exemplified in that singular affection known as *mollities ossium*, or rickets. Phosphorus and potash are respectively essential elements to the nutritive materials of nervous and muscular tissues.

Chloride of soda exists mainly in the plasma; when taken into the stomach it is decomposed, and forms hydrochloric acid and soda; the former of these is appropriated to the gastric juice, and the latter to the bile. Chloride of soda is evidently continually being formed in the system by the union of its appropriate acid and base, and when in excess in the blood it causes the red corpuscles to crimple or contract, so that they attract water rapidly from the blood and tissues by endosmosis, and hence the sensation of thirst arises as an indication of the deficiency of fluids.

The saline constituents of the blood are deficient in all the malignant grades of continued fever, in cholera, and in the latter stage of pregnancy. In such conditions the indi-

cations for supplying these ingredients to the blood are obvious, and often urgent.

Water usually constitutes rather more than three-fourths of the entire volume of healthy blood. It is an appropriate vehicle for the conveyance of the plastic materials to the various parts of the system, and for the removal of waste material and other deleterious principles from the body.

Water, by its solvent properties, presents the nutritive material in a form easily appropriated to the wants of the tissues, and it dissolves the effete materials, and presents them to the excretory organs in a form that facilitates their expulsion from the system.

The quantity of water in the blood may be increased at will by free indulgence in liquid drinks, or it may be diminished by abstinence. In anemia, whether produced by the sudden loss of blood, as by hemorrhage, or by debilitating disease, the proportion of water in the blood is largely increased. In diseases reputed to be of malarial origin, as obstinate remittent fever, and chronic diarrhœa, the blood becomes decidedly watery—there is hydremia, with marked tendency to dropsical effusions. In our recent large armies all medical officers must have observed that hospitals and convalescent camps were often crowded with soldiers suffering with the last named affections, and that almost all were anemic, hydremic and dropsical. *Excess* of water in the blood, which generally takes place at the expense of the red corpuscles, and other organic constituents, deranges the nerve centers, and gives rise to an obtuse state of the intellectual faculties, and to neuralgic pains, and cardiac palpitations, and bellows murmur heard loudest at the base of the heart, and propagated along the course of the aorta. Diminution of water in the blood is consequent upon long continued abstinence from fluid ingesta, and is a secondary element in all diseases attended with profuse discharges of water from the system.

Therapeutic agencies consist of measures calculated to

eliminate water from the system when it is in excess; for this purpose diuretics and hydragogue cathartics are often demanded. Of these classes of medicines, buchu, turpentine. elaterium and bitartrate of potash are generally the most eligible. These should be followed by iron and other tonics, to give solid constituents to the blood and tone to the general system.

The water, when deficient, should be increased by the free use of liquid ingesta, and the arrest of all excessive drains of water from the system.

CHAPTER IX.

THE IDIOPATHIC OR ESSENTIAL FEVERS.

Fever is both a symptom and a disease. As a symptom, it indefinitely comprehends a hot skin, quick pulse and suppressed secretions, which phenomena arise symptomatically in various forms of disease. But its more definite acceptation, and that of which I now design to treat, is a class of diseases consisting in various contaminations of the blood, and usually characterized by and denominated *idiopathic Fever*. These essential fevers are produced by a great diversity of causes, and are therefore dissimilar in their etiology and in their types; but the various species are analogous in these important characteristics, namely: they are each idiopathic, and they each consist in deterioration of the quality of the blood by morbific influences and agencies received from without or generated within the system.

Then it is an important fact that the various species and grades of essential fever are but so many of the qualitative changes of the blood, and that the phlegmasiæ and other supervening congestions evince the specific character of the polluting influence or agency, and as well do they attest the fact previously stated, that qualitative change in the blood leads to quantitative change, and *vice versa*. As a class of these essential fevers, and a sub-class of those qualitative changes in the blood, we shall notice first the major Exanthemata, comprehending by this term such affections as consist in a specific animal virus which renders them capable of propagating themselves, or of being communicated from one

person to another. Most of these affections are such as seldom occur more than once in the same individual; and it is a distinguishing characteristic of each of them that they are usually accompanied by fever and by exanthematous eruptions, which may be in the form of erythema, rash, vesicles, or pustules.

The following table exhibits the eruptive fevers according to their individual peculiarities and distinctive characteristics, and also the most marked types and grades of non-eruptive essential fevers:

Essential Fevers.

Eruptive.	Small-pox, Measles, Scarlatina, Cow-pox, Mumps, Erysipelas, Glanders.	Non-eruptive.	Paroxysmal.	Intermittent, Remittent, Yellow Fever.
				Febricula, Relapsing, Typhus, or Typhoid.

Typhoid is allied to the eruptive fevers in some of its essential characteristics; thus it often, but not invariably, originates in, or arises from, a specific animal poison: besides, it is contagious, and is not unfrequently accompanied by eruptions. But in the preceding table it is placed with the non-eruptive species of fever because it is peculiarly allied to them as evinced by the circumstances that even the higher grades of non-eruptive fever often terminate in typhoid.

Each of these eruptive fevers is quite distinct from the others of the same class in the essential character of the virus or the effluvia from which it arises. Each one is also peculiar to itself in its definite period of incubation, and in the mode of its development. On the other hand, they present many points of similitude: they each arise from an animal poison—they each run a definite course—each is attended by some form of eruption involving the skin and

often the mucous membranes as well—each is accompanied by fever, and all are contagious; so that to consider them together is but to observe the classification of nature.

The symptoms and signs common to all of these eruptive fevers are successively malaise, shivering or rigor, pain in the head and back, fever, and eruption on the skin, with more or less efflorescence of the mucous membranes, especially of the fauces and pharynx, which often gives rise to severe angina. The edges and tip of the tongue are usually red, and its center is covered with fur, through which red papillæ project.

What is the rationale of each of these phenomena? Evidently the malaise is the incipient effect upon the organic functions of the poison in the blood. But why the rigor and the fever? Are these extremes of temperature both produced by a common cause—the presence of a poison in the blood? We think so. The most learned and gifted pathologists have presented a contrariety of opinions and hypothesis respecting the rationale of heat in essential fever. The increased respiration and oxygenation of combustive materials evidently give rise to this phenomenon.

It is true that a motor nerve may be excited by irritating a sensitive nerve, and that the secretion of a gland and the nutrition of textures are excited by irritating a ganglion or a branch of the sympathetic nerve. Perhaps the phenomena of fever are produced by alternately exciting and exhausting the influence of the ganglionic system of nerves. The altered quality of the blood, and perhaps the direct influence of the *materies morbi* which it contains, irritates this system of nerves, and thereby diminishes the heat which answers to the chill or rigor, and under the continued irritation and excitement this influence is exhausted, and thus heat is generated, which answers to the stage of fever.

The exanthem or eruption is a specific inflammation produced by the specific animal poison in the blood. These toxæmic diseases clearly exemplify what has been termed

the *vis medicatrix naturæ*, which is but the limited capability of the system to resist or throw off disease. The presence of any noxious matters in the blood excites the functional activity of the secreting organs, that is, of the entire glandular system, which properly includes the skin as well as the kidneys.

If the foreign matter in the circulating fluid is either one of the specific animal poisons from which these eruptive fevers arise, it multiplies by germ-growth or fermentation; but whatever is the nature of the *materies morbi*, it is in itself entirely passive as to special localization. As a foreign substance in a bronchial tube, or in the womb, excites expulsive efforts, so every secreting organ is excited by the presence in the blood of any foreign substance, and each appears to strive with increased energy to cast the intruder out of the system.

Thus it is true of the zymotic poisons from which these eruptive fevers arise, that their very effects upon the blood and upon the glands and their secretory functions engender a process for their elimination from the system. Hence we observe that in most of these affections, and especially in small-pox and measles, the presence of the poison being intolerable to the system, is cast to the surface more rapidly than it can be excreted by the skin, and thus the eruptions have their origin. But the poison does not here await its turn; its presence as a foreign substance, and especially as a specific virus, irritates the skin, and excites a vast multiplicity of local congestions or inflammations of that organ, and these assume the character of numerous circumscribed eruptions or pustules. Now these numerous eruptions furnish the virus with so many avenues for its escape from the system; for each eruption, whether in the form of a rash or a pustule, emits a portion of the *materies morbi*. Therefore, the more numerous the eruptions, the more rapidly will the poison be expelled from the system. The amount of eruption in any given case is determined by the quantity

and the degree of virulence of the poison which the system has imbibed, and by the degree of resistance the organism is capable of opposing to its invasion.

The poison of these eruptive fevers generally invades debilitated systems with great energy, for in such there is little capability of resistance to its ravages; so that the poison remains in the blood polluting more and more the fountain of life, and, instead of being driven to the surface, where it could find a ready exit from the system, it is thrown upon the more delicate textures within, and especially upon the mucous membranes, where it produces its characteristic eruptions. These cases, without enlightened and judicious interference, tend certainly and rapidly to death.

When the system is invaded with energy on account of the quantity and virulence of the poison, the resistance opposed to it by the secretory system may be considerable, and the processes of elimination and depuration may be carried on with an energy corresponding with that of the invasion. Thus the conflict becomes long and doubtful, and while the resistance is sufficient to drive much of the poison to the surface, as evinced by numerous eruptions on the skin, the force of the poison is sufficient to hold a disputed position in the blood, and to accumulate in, and give rise to, specific inflammation of the mucous membranes, which are but the internal reflections of the integument of the body. As the external skin forms the covering, the internal skin or mucous membrane forms the lining of the body and its open cavities, and is, therefore, in point of delicacy, as a plant which has grown in the shade. For these reasons the eruptions appear inversely on the skin and mucous membranes.

These considerations explain the reasons why the mucous membranes generally suffer lesion in these zymotic fevers; and these specific lesions account for those ever-present concomitants which add so much to the sufferings and the danger. I allude to the tonsilitis, bronchitis, nephritis and

the enteritis so often produced by the specific poison from which these fevers arise.

Either one or all of these specific *itises* may arise in either variety of this class of essential fever. But we usually find the most severe angina with sloughing of the tonsils, and mucous membranes about the fauces and pharynx in scarlatina and variola. The Shneiderian membrane, bronchial tubes, and the intestinal follicles, all suffer in measles. The kidneys and ureters often suffer seriously as a sequel to scarlatina. In glanders, the Shneiderian membrane and all the air passages, and ultimately the soft tissues, generally are effected. In typhoid fever the poison usually affects the follicles of the velum palati, and small intestines. These various lesions demonstrate the specific character, the activity, and the peculiarities of the respective zymotic poisons which give rise to the several species of eruptive fever.

General Principles of Treatment.—There is no known specific antidote to which either of the respective poisons from which these fevers arise is amenable; but the preceding facts, connected with their pathology, indicate many therapeutic measures well calculated to shorten their duration, diminish their severity, and conduct them to a favorable termination.

In the treatment of these fevers, friendly results are most readily and certainly secured by the observance of these obvious indications: 1. To foster the powers of the system, and, as far as possible, guard against internal local lesions. 2. To promote the early appearance of abundant eruptions on the skin; these, when of the phlegmatous variety, tend to exhaust the poison, both by affording it a channel of rapid exit from the system, and by increasing the process of oxydation. 3. To secure and maintain the free excretion of noxious matters from the system by promoting the functional activity of all the secretive organs, and especially of the skin and kidneys.

The bowels are to be encouraged, when necessary, to one or two soluble dejections daily to remove all irritating excrements, and thus prevent local irritation and general contamination produced by their continued contact with the delicate texture of the intestines, and by their reabsorption into the blood. But excessive alvine evacuations should be carefully avoided, as tending to rapidly exhaust the powers of the system, at a time, too, when the energies should be fostered to resist the encroachments of the poison. It is an anamoly, but is no less a truth, that the diarrhœa which comes on during the convalesence from measles is a salutary process, and should therefore be tolerated or even encouraged within due bounds.

Diaphoretics and diuretics are of signal service in promoting the secretions of the skin and kidneys. Tonics and antiseptics are urgently indicated, of which the tr. of the chloride of iron is most eligible, as possessing both of these properties in the highest degree. Sulphur is a good germicide.

After the first stage of excitement has passed, quinine is useful on account of its tonic and febrifuge properties. Mild but nourishing food, when it is not loathed, is essentially proper in each of the various grades and stages. Alcoholic and other stimulants are indicated in the incipiency of an attack, to drive the eruption to the surface, and also in the stage of desquamation, to maintain the flagging powers of the system.

The usual inflammatory and other complications are to be treated according to such circumstances as their location and degree of severity may present. The inflammation about the throat is most effectually allayed by astringent, acid and chlorinated gargles, and by counter-irritants applied externally. These anginose complications are often much relieved by the application of emollient cataplasms over the region of the throat.

When the inflammatory complication is seated in the

tubes or parenchymatous structure of the lungs, an expectorant is demanded, for which I usually prefer ipecacuanha, honey, and tr. opii, in water. Here, too, counter-irritation may be of much service. When the lesion is in the follicles of the intestines, or any other portion of the primæ viæ, oil terebinth is often highly useful, especially when there is hemorrhage or effusion of blood from the bowels. The denuded surfaces may be blandly sheathed by mucilaginous drinks, such as elm-water, or the mucilage of gum acacia.

It is an important fact which every practitioner should observe, that mercury is especially damaging to a system which is infected with either of these or any other zymotic poison, and it is not admissible in the treatment of these eruptive fevers, except perchance it may be urgently demanded to meet some hepatic complication.

Prophylactic measures display their greatest efficiency against these zymotic diseases. The protective power of belladonna against scarlatina has long been a moot point. Such preventive properties have been repeatedly asserted of this drug by eminent authorities, but all experiment has furnished but little positive testimony in vindication of the assertion. But its action appears to be sufficiently favorable to warrant its use, as scarlatina is usually the most active in its invasions, and often the most fatal, of all the eruptive fevers. Some of these eruptive fevers, as Rubeola, Scarlatina and Variola, affect the same system but once during life; so that the entrance of either of these poisons into the system is a pretty reliable prophylactic against future attacks or invasions from such poison. The prophylactic property of vaccine virus against small-pox has well nigh shorn that dire affection of its fatality and its terrors. The discovery of this valuable property of the vaccine by Dr. Jenner, of England, is but one of the countless blessings which the researches of medical science have bestowed on humanity.

Ectrotic or Abortive Treatment of Variola.—It is a triumphal boon to science and to humanity that small-pox may be

evaded, or rendered benign, as above noticed. Besides, when it attacks those who are so protected, it may be much ameliorated and rendered abortive, or comparatively powerless for evil, by such topical applications as either cauterize or form adherent scab-like incrustations over the pustules. Either of these measures will arrest the development of the pustules, diminish the suffering, and protect the sufferer against the disfiguration usually produced by deep pitting or unsightly cicatrices.

The pustules may be cauterized by picking them with a needle which has just been inserted into a strong solution of argent. nitras, or by touching them with a fused stick or the solid crystal of this substance. A coherent and efficient crust may be formed upon each pustule by applying a plaster formed by saturating the sulphate or the carbonate of zinc with olive oil. Drink lemon juice and elm-water.

Non-eruptive Fevers.—The exanthematous fevers which we have been considering may truly be said to present various *kinds*, since each of these fevers depends upon a distinct specific virus, and is peculiar to itself; but not so of all the grades presented by the paroxysmal and continued fevers, which classes are both included under the denomination "non-eruptive fevers," of which we now design to treat. However, we would exclude from the range and force of this remark typhoid, which is sometimes eruptive, often produced by a specific cause; and, being a malignant form of continued fever, it is capable of being propagated by fomites, and doubtless as well by inoculation. But it should not be inferred that typhoid can originate in no other way. This, as well as all the grades and types of paroxysmal fever, is liable to be produced by a great diversity of common causes. Besides, it is liable to present itself during the course of every continued fever, however mild the attack may appear to be; for this fever occurs in all seasons, and attacks systems under numerous and diverse circumstances, and

thus it is that it assumes various grades, divers forms and dissimilar phases.

These considerations point to the pathologist as the only just arbiter of the states of the system in, and of the mysteries which envelop the phenomena of these important forms of disease. These investigations elicit the hidden truths of the abstruse science of medicine as connected with the various states of the system covered or designated by the common appellation "*essential fever*," or even by the term "continued fever." Such truths stand as far beyond the comprehension of the unlearned, and the ken of "snobs," as do the phenomena, with which they are associated, beyond the pretended ameliorating influence of vaunted panaceas and quack nostrums.

Paroxysmal Fevers.—For convenience, and in observance of their distinctive peculiarities of type and etiological relations, I shall consider the remaining forms of fever in two classes, namely: *paroxysmal* and *continued.* But it should be remembered that the types of these fevers change with great facility, so that an intermittent readily passes into a remittent, and this by an easy transition as readily becomes a continued type. Paroxysmal fever manifests its most marked tendency to pass into a continued type about the time of the decline of its greatest prevalence, which is late in the fall season.

The *causes* of these paroxysmal, marsh malarial, or autumnal forms of fever, may be pretty readily and satisfactorily explained. The humid atmosphere arising from marshes, and charged with noxious gases arising from the decomposition of organic matter, may be, and doubtless is, a sufficient cause. Especially is this cause active when conjoined with heat, evaporation, and other solar influences, as is well demonstrated by the great prevalence and endemic character of these affections among the inhabitants of marsh-lands, particularly toward the decline of long hot seasons.

Heat, when conjoined with a full carbonaceous diet, may

produce paroxysmal fever by rarefying the atmosphere, which diminishes the quantity of oxygen inhaled, and thus interferes with the process of oxygenation of combustive materials in the blood, so that the hydro-carbons are permitted to accumulate in the system faster than they can be eliminated by the liver and lungs; hence, the liver is overworked, and the blood becomes contaminated.

All debilitating influences tend to produce the paroxysmal and periodic affections. Hence, convalescents from the more intense grades of fever, and persons who have suffered exhaustive drains from the system, or from diarrhœa or hemorrhage, are very liable to these attacks. Allied to these types of fever, arising from the same causes and amenable to similar treatment, are various periodic recurrences of opthalmia, diarrhœa and neuralgia.

The varieties or different types and grades of fever belonging to this class are: ague or intermittent, bilious or remittent, and yellow fever, Ague may be quotidian, tertian or quartan, according to the type which marks its periodicity, or the length of the interval between paroxysms. Each of these types of ague is distinguished from bilious fever by a period of complete intermission of the fever occurring between the termination of each exacerbation and the commencement of the next.

Bilious or remittent fever is marked by a continuation of the fever, of which there is a decided remission or abatement occurring at regular intervals. The remissions usually occur every morning, and the fever rises as the day advances, and the exacerbations are often attended by much arterial excitement and gastric distress, which are well calculated to excite alarm in the mind of the novice in practice; but the real danger is not considerable, except from cerebral or other rare complications. Under appropriate treatment the fever is usually of but a few days' duration, and the prognosis is almost universally favorable.

Yellow Fever.—This species of fever is of the paroxysmal genus. It arises from the same causes as remittent, but requires a much greater intensity of their action. It is, therefore, confined to high temperatures and hot climates, as the West Indies and some of the southern cities of the United States. Yellow fever may arise sporadically, and it may be propagated by contagion. There can be no doubt of the contagious character of its most malignant grades. Indeed, all malignant diseases are contagious—they are communicable from one person to another in some way. This fever may occur in a very mild character, but it is usually malignant and fatal in its tendencies. Its symptoms are those of bilious fever intensified to a degree corresponding with the greater force and intensity of the causes. The attack is generally sudden. The pyrexia, heralded by but few premonitory symptoms, is often so powerful that the secretions are almost entirely suppressed at the outset. There is severe pain in the head (usually frontal), back, legs and epigastrium. There is extreme irritability of the stomach, frequent vomitive efforts, and often vomiting of a colorless tenacious matter, followed finally by a dark, grumous matter; hence, the name *"black vomit."* There is usually much hepatic derangement, with cholemia, and often profound stupor; hence, in terms scarcely so arbitrary as yellow fever, the affection has been called *"typhus icterodes,"* which words are derived from the Greek, and imply stupor and yellowness like the eyes of a weasel.

These paroxysmal fevers all invade the system through the blood; they all manifest a congestive tendency, and are all characterized by a well-marked periodicity. It is further true of them, in a general sense, that their tendencies to malignancy and to periodicity are in inverse ratio. Hence, in the mild grade known as ague there is complete and often long-continued intermission. In the yet mild but more severe form known as bilious fever, there is only a remission which is at most of but a few hours' duration; while in the

malignant grade known as yellow fever, the remission is very transient and scarcely perceptible.

True to the inferences derived from etiological deductions the liver suffers in these affections, *cæteris paribus*, more than any other organ. It is either in a state of torpor from over-work or excessive functional activity, or it suffers perceptible lesion of its structure, which is often revealed by the unerring *post mortem*. Fatty degenerations of this organ in persons who have died of yellow fever; and hepatic abscess in those who had suffered long from such chronic affections as ague, dyspepsia and dysentery, have been so frequently observed that it is a subject of wonder that all pathologists, and medical men generally, have not taken the hint.

The liver is not a "scape goat," nor does it enjoy immunity from the encroachments of disease. The many extreme and absurd ideas which have prevailed respecting the physiological functions and anatomical lesions of this organ have led to many errors in practice.

The spleen is a kind of reservoir, and is the receptacle of an increased amount of blood during each successive chill or cold stage which precedes each febrile exacerbation. In consequence of these repeated congestions this organ becomes enlarged, and retains in the ramifications of its capacious vessels an augmented onus of blood. Other lesions sometimes found in the subjects of paroxysmal fever are such as may occur in any of the essential fevers.

Treatment of Paroxysmal Fever.—The milder grades of paroxysmal fever, as ague and bilious fever, are remarkably amenable to treatment; but its most grave forms, such as are known as congestive chill and yellow fever, are often fraught with fatality, and sometimes terminate in death before aid can be summoned. Each of these forms, however, may be comparatively mild. Who can distinguish a difference between a severe ague chill and a mild congestive chill? or between a severe grade of bilious fever and a mild grade of yellow fever? I presume no physician will attempt to

make these discriminations, seeing they are without differences; and certainly if a difference exists in either case, it is in degree only. Then it follows that the same general principles of treatment apply alike to all, and that the same therapeutic agents that are curative in one are, in some degree, efficacious in all. This is eminently true of cholagogues, sudorifics, tonics and nervines.

The measures here suggested are to be varied to meet the indications presented by the various grades and complications of individual cases. Thus the ordinary forms of ague and of bilious fever will generally yield to a purgative, consisting of the mild chlor. hydrarg. 3 to 5 grs., with 10 to 15 grs. rhei., followed by 36 grs. of the sulph. quinine, in 6 gr. doses taken two or three hours apart during the intermission or the remission. More severe cases of bilious fever will require the use of the quinine to be continued in this manner till the fever is arrested, which seldom requires longer than three to five days' timely and appropriate treatment. During the febrile exacerbations nitre may be administered, and cold water should be poured lavishly on the head; but this should be withheld when the patient is sweating freely; also, when it ceases to be comfortable to the sufferer. Food of all kinds is loathed till the disease begins to subside; but when the appetite returns, it should be gratified with a reasonable amount of mild and well-cooked nourishment.

Yellow Fever requires, in the beginning, a mercurial cathartic to clear the bowels of morbid secretions and accumulations of fecal matter, and to aid the liver in the performance of its functions. This should be followed by large and frequently repeated doses of quinine—say 10 grs. every two or three hours. Opiates should be administered when required to produce sleep and allay morbid vigilance. Gastric irritability may be allayed by effervescing draughts, and by the application of sinapisms, or fly plasters, to the epigastrium. A piece of linen wet in cold water, and applied to the throat, very often arrests vomiting. It is

very important that the kidneys be aided in the performance of their secretory functions by diuretics, of which turpentine is the most eligible.

The prognosis is pretty favorable as long as the renal secretion is actively maintained; and if, in addition to this, at the seventh day, there is not copious vomiting of black matter, recovery is almost certain.

Congestive Chill demands stimulants internally, and counter-irritants diligently applied externally during the stage of congestion, and in the interval quinine should be administered in large doses.

Ague often becomes chronic, in which stage it sometimes refuses to yield to the ordinary remedial measures, unless they are persisted in till their use becomes as chronic as the disease. The tincture of iodine administered in a dose of gtts. viij. in an ounce of dulcified water, twice a day, to adults, has often speedily eradicated the affection. This use of the drug was suggested by the presence of a strumous diathesis in many of these cases.

Emetics often produce the most prompt and satisfactory effects in all of these paroxysmal fevers. They cleanse the stomach, promote hepatic action, and often cut short the fever. When emesis is desired for this purpose, it should be produced by ipecacuanha. Antimony and lobelia should rather be used to nauseate monks than to collapse people. The "root and herb doctors," who have in every way a strong tendency to produce vomiting, have occasionally arrested an ague with their lobelia.

Continued Fever.—Essential fever presents a variety yet to be considered, having several grades of a continued type. The name "continued fever" applies alike to each of these grades, but nosologists have arranged them into classes, and found for them names as so many diseases, or independent and distinct kinds of fever. Thus the four following groups of symptoms, which mark as many stages and grades of continued fever, are, according to Drs. Jenner, Tanner, and

others, named and treated as so many kinds of fever or distinct diseases, distinguished from each other by well-marked specific differences. Believing such distinctions to be unreal and absurd, I conveniently employ these groups of symptoms, and bastard names, merely to designate the several stages and grades of continued fever:

Febricula, which is mild and non-contagious as such, is sudden in its attack and short in its duration, and is attended by arterial excitement, headache, backache, white tongue and frequent pulse.

Relapsing fever—a form of fever often engendered by specific influences. It may prevail as a contagion or as an epidemic, and is medium in grade between febricula and typhus. It is attended by the usual febrile symptoms, such as rigors, alternated with the flush of fever, headache, constipation, hepatic derangement, etc. When the fever has continued about seven days, profuse perspiration usually comes on, and there is a sudden abatement of all the symptoms, and convalescence appears to be permanently established; but at the next septenary period there is a return of all the primary symptoms, which after remaining a few days again subside, and the return to health is rapid.

Typhus is a more continuous and grave form of fever, and, in addition to the initiatory symptoms just mentioned, there are stupor, a dry brown tongue, delirium, and often a mulberry rash, which makes its appearance on the body between the fifth and eighth day. The fever is obstinate, and generally does not terminate before the twenty-first day. The lesions usually found after death are enlargement of the spleen, and congestion of the various organs, or parts, enclosed in the ventral cavity, and especially of mucous surfaces.

Typhoid, like typhus, arises from the same specific cause, is contagious, is attended by stupor, rash and extreme debility, and is even more persistent and fatal in its tendencies. Diarrhœa is usually present from the beginning, or is one of the earliest evidences of the approach to typhoid. In

all low grades of continued fever the bowels are apt to move readily and freely under the influence of half the ordinary dose of any cathartic medicine, and even the higher grades will readily run into typhoid if excessive purgation is produced or permitted. The bowels are usually tender to pressure in the region of the right iliac fossa. The tongue becomes dry and cracked, and the lips and teeth are often covered with a black secretion called *sordes*. The surface is generally cool and often moist, especially after the fifteenth day. The circulation is accelerated, and generally the frequency of the pulse is in direct ratio to the severity of the case.

The lesions found after death are enlargment and softening of the spleen, which often contains numerous singular bodies, which, according to Dr. Bennett, consists of splenic pulp in a state of peculiar degeneration, and yellow discoloration; but, according to Rokitanski, they consist of a true typhus deposit. The mesenteric and intestinal glands are generally congested, and often there is ulceration of Peyer's patches.

Such are the symptoms and lesions common to four different stages and grades of continued fever; I therefore demur to the doctrine that these several grades are as many distinct diseases, for the following satisfactory reasons:

First. The aggregate of the symptoms and lesions noticed by Jenner (in his very able monograph on fevers) as pathognomonic respectively of Febricula, Relapsing Fever, Typhus and Typhoid Fever, may all be present at the same or at different times during the course of a severe and persistent fever; hence a fever may set in as a synocha, degrade into a synochus, and finally terminate in typhoid.

Second. The poison of continued fever may be communicated from one person to another by contagion; it may arise sporadically, or it may be generated in the system by the accumulation in the blood of a superabundance of waste material derived from tissue metamorphosis and retained in the system in consequence of the tardy secretory action com-

mon to all febrile affections. Thus it is, that a fever having no specific cause often assumes a specific character, becomes contagious, and presents the most grave symptoms and lesions.

Third. The various symptom which Dr. Jenner pointed out as peculiarly characteristic of certain *kinds* of continued fever, are not necessarily produced by as many distinct prime specific agencies, but are generally consequent upon and indicative only of the stage and grade of the fever. All protracted fevers in their advanced stages present similar lesions and symptoms, and such generally as indicate a low grade.

Continued fever arises from a great diversity of causes, prevails in all seasons, and attacks persons of all ages, habits of life, and constitutional peculiarities. Besides, its grade and character are peculiarly influenced by the character of contagious and epidemic influences prevailing at different times; so that it would be a singular anomaly if it did not present the various phenomena and phases which have been erroneously considered as so many distinct diseases.

The *causes* of continued fever embrace all influences and agencies capable of deteriorating the blood and debilitating the system. Among the most frequent causes may be mentioned a specific animal virus which may be communicated from one person to another—non-cognizable agencies, or epidemic influences, which are supposed to originate spontaneously and to exist temporarily in the atmosphere of any locality—insufficient and improper nourishment—heat or cold long continued, especially when conjoined with dampness—dark and ill-ventilated apartments—filth, and the effluvia arising from putrescent animal bodies.

Symptoms.—The symptoms common to its various stages and grades have been mentioned respectively under the several heads—Febricula, Relapsing Fever, Typhus and Typhoid.

Diagnosis.—When a fever begins with a frequent, full and bounding pulse, and continues to run high without remis-

sion for forty-eight or seventy-two hours, it is not likely to be an idiopathic fever at all, but is symptomatic of inflammation in some of the textures of the system. If the fever is characterized by well-marked intermissions or remissions, and especially if these occur of mornings, the fever is idiopathic, but it belongs to the paroxysmal, and not to the continued type of fever. But when the fever comes on after a few days or weeks of malaise, and continues steadily from day to day, with an irregular distribution of heat, it is most probably the common continued fever. The presence of slight remissions should not militate against this diagnosis, as these are common to continued fever in all its grades, but are less perceptible as the form of the fever is more grave. If there is diarrhœa, listlessness and stupor, the diagnosis is strengthened. Ulceration of Peyer's glands, as indicated by diarrhœa and tenderness to pressure in the right iliac region, have been held as pathognomonic of typhoid fever. But these phenomena, though strongly corroborative, do not always prove that typhoid is present, neither does their absence prove that typhoid is not present.

Much has been said and written respecting the differential diagnosis between *typhus* and *typhoid* fever, which have been supposed to be two distinct kinds of continued fever. This reminds us of the absurdities of the darker ages. We have all read of the three kinds of scarlet fever—the *simplex*, *anginosa* and *maligna*, according to the grade and local tendency of the affection. And we have heard of the two kinds of measles—the big red, and the little French kinds—which are the results of circumstances which promote or retard the eruption ; of course, the big red kind was the milder. Now we hear of the two kinds of continued fever—*typhoid* and *typhus*. Here again the distinction is founded on the grades and phases of the fever. If the quantity and virulence of the poison are sufficient to irritate the mesenteric and intestinal glands (which appear to excrete it), and produce diarrhœa, and to break down the red corpuscles, and retard

the motion of the blood through the capillaries, and thus give rise to small red spots on the surface, the fever is said to be the *typhoid* kind; but if the poison acts with less intensity, so that there is less prostration, less intestinal irritation and its consequences, such as tenderness, diarrhœa and hemorrhage, then the fever is called *typhus*. Now these unwarrantable distinctions make a trio of parallel absurdities which are reproachful to a learned medical profession. It is even strange that such doctrines can be imposed on popular credulity.

Prognosis.—It is generally difficult, and often impossible, to tell in the beginning of a continued fever what grade it will assume, or when it will terminate. If there is no considerable prostration, and the pulse is regular and but little above the normal standard, the attack is usually mild, and may pass off in a few days as a febricula, or about the seventh day as a relapsing fever. Or it may go on till the end of the second, third or fourth septenary period, the grade usually becoming lower as the disease continues till it assumes the lowest grade of continued fever, known as typhoid.

On the other hand, if the fever begins with a frequent pulse ranging from 120 to 140 beats per minute, with diarrhœa and prostration, and especially if delirium is present, the attack is most grave, and the condition of the patient is precarious. In such cases as this, the fever does not pass through the higher grades known as febricula, relapsing fever and typhus, but is a genuine typhoid from the beginning. The attacks are more common, and the disease is more malignant and contagious when it is intensified by epidemic influences.

In the early stage unusual talkativeness of the patient, and the hallucination that he or she is not sick, and should be up and attending to business, are decidedly unfavorable symptoms. Hemorrhage from the bowels, acuteness of hearing, evacuating the bowels, or voiding the urine unconsciously, and *muscæ volitantes*, or catching at imaginary

objects, each augurs unfavorably; but there may, in a rare instance, be a recovery when each of these symptoms have at different times been present. But all together, they warrant the most unfavorable prognosis of all phenomena this side of the awful hour of *psychorages.* Add to all, or a part of the above symptoms, a flagging pulse, and slow and labored respiration, with elevation of the shoulders at each inspiration, and the sufferer is *moribund.*

On the other hand the favorable symptoms are a regular pulse tending to the normal standard in frequency; the urine less colored, the tongue becomes moist, and begins to shed its coat; the sordes begin to disappear from the teeth, tongue and lips; the appetite begins to return; delirium gives way to recuperative reason; coma is dispelled by natural and refreshing sleep. The patient now complains of being uncomfortable in the dorsal decubitus previously preferred, and begins to draw up the legs, and to express a desire to change from the dorsal to the lateral decubitus; the strength increases, and the return to health is slow but pretty certain.

Treatment of Continued Fever.—In this as in other diseases, the treatment should be varied according to its various stages, grades and complications. In some of its forms it requires but little medicine, and in no case does it require so much debilitating medicine as is too frequently administered. It is to this error in practice that most of the fatality of fever is due. Mild attacks in which there is no diarrhœa require about half of an ordinary dose of some mild purgative in the beginning to clear the bowels. A drachm of the syrup rhei is very eligible, and this should be made the vehicle for two or three grains of the mild chlor. hydrarg. if there is much hepatic derangement. Afterwards care should be taken to prevent the bowels from moving too freely, and no circumstance is likely to warrant the further use of mercury. This should be followed by oil terebinth, gtt. x., *bis in dies;* sulph. quinine, grs. iv., *tert horis vel ter dies;* and

opii, gr. j., *hora decubitus;* warm bath. I have often seen the fever cut short by these means timely administered. But if the fever continues, let this treatment continue as long, omitting the mercury and the purgative, except in rare instances.

The bowels should, if possible be confined to one evacuation every twenty-four hours; if they are at any time to be encouraged to this, a light dose of ol. ricinis will suffice. If, as is most usual, the bowels require restraint, a few grains of tannin after each operation will often suffice; but the most effectual dose for this purpose consists of pulv. opii, gr. ss., and acetas plumbi, grs. iij. As an alternate, with either of the measures mentioned for checking the bowels, I have often been pleased with the effect of a mixture consisting of tr. opii, tr. camphor, and tr. rhei, in equal parts, and capsicum in the proportion of 10 grs. to the ounce; dose, one drachm, repeated every hour, or oftener if necessary. I have thus dwelt upon the means of holding the bowels, because it is a *sine qua non* in the treatment of the lower grades of continued fever.

Complications, when they arise, must be treated on general principles; but no inflammation, however important the organ involved, will justify the free use of antiphlogistics. Local hyperemia may be relieved by counter-irritants in the form of sinapisms, or a fly-plaster. Headache and often delirium, may be relieved by the application of cold to the head by means of ice-bags kept in contact with the head, or the frequent pouring on of cold water. But these means should not be resorted to while the patient is sweating freely; or if they produce chilliness or other unpleasant sensations at any time, they should be temporarily withheld. A fly-blister at the back of the neck is often of signal service in relieving the brain, and obviating delirium and coma.

Hemorrhage from the bowels seldom occurs in cases treated from the beginning with turpentine; but when it does occur, the terebinth should be doubled, and tr. chlor. ferri

administered in half-drachm doses every six hours, and the bowels should be locked with opium for two days. I have often known the hemorrhage arrested and recovery to ensue after two quarts of dark and offensive clotted blood had been discharged from the bowels.

Alcoholic stimulants should be administered in small quantities every two hours, and as much oftener as may be necessary, to obviate extreme prostration, and to keep up an equable circulation. Thousands have sunk to premature graves under the prostration attendant upon continued fever when they might have recovered by the free use of brandy.

The patient's entire surface should be washed by sponging with tepid salt water every second day, and the apparel changed as often. In fine summer weather the room should be so ventilated that the patient can breathe freely from the great ocean of pure atmospheric air. The feet should be kept warm at all times. Visitors should not crowd the room; quietude is at all times desirable, and especially at night. The patient should drink moderately of elm water and ice water; but the latter should be withheld when it moves the bowels, as it sometimes does.

Food, when not loathed, should be taken often, but in small quantities, and while it is cool, and should consist of milk, panada and animal broths.

CHAPTER X.

TETANUS—GANGRENE, AND SYPHILIS.

Specialties are not in favor with the author, who is accustomed to think, write and practise, in the guidance of principles of extensive application, upon which specialties rest. From this standpoint it is his present purpose to extend some thoughts, briefly and in succession, to Tetanus, Gangrene and Syphilis.

The two last mentioned have some degree of analogy in this, that each depends upon animal poison; ergo, their etiology is with the zymoses. Tetanus is not included in this trio, because of analogy to the others; it does not necessarily possess any character in common with them. It properly belongs to the neuroses; its pathology has never been definitely settled, and it is very obstinate. The muscular contractions which characterize tetanus depend always I believe, upon injury to a nerve; generally, a small twig at the distal extremity of the nerve. It may, but seldom does, occur idiopathically; it almost always occurs traumatically in those who are suffering from a wound or injury, and is by far the most likely to occur if the wound is very slight and is situated on an extremity. It is more liable to be produced by a wound on the foot than on the leg, and more likely if the wound is on the hand than on the arm. Wounds of the feet and hands expose to equal liability to tetanus; a very trivial wound of the web between the toes or the fingers or under the nail, frequently produces tetanus. The able Professor of Pathology in the St. Louis Medical College, in

speaking of the causes of tetanus, quaintly remarked that it is often caused by sticking a spicule of cornstalk under the nail of the great toe.

The robust and middle-aged are not so liable to tetanus as the delicate and the old. The oppressive heat of summer predisposes to tetanus, as do hot days alternated with cold nights. In our late cival war, and in the Peninsular war, it was observed that the wounded men who had to remain for many hours without shelter, and without having their wounds dressed, were more liable to be attacked with tetanus.

This, like all obstinate forms of disease, has had many vaunted remedies; but one has given place to another till almost every drug in the *materia medica* has been tried. But few have proved to be even palliative; mercury, opium, cannabis Indica, and the terebinths, are useless generally. The nerve leading to the wound should be divided; this is often effective when done early. Chloroform and sulphuric ether, from their potential influence upon the nerve centers, ought to control this affection more effectually than any known substances. It is remarkably strange that these agents, which so promptly control both sensation and reflex action, have not been more frequently used against tetanus.

It is manifest that the sympathy of the spinal cord with its nerve branches accounts for the characteristic contractions. When the distal extremity of a nerve suffers injury, the irritation is carried to the spinal cord, and is reflexed back by the motor filaments with perverted energy upon the voluntary muscles. In the hands of the author, chloroform has proved to be an effective modifier of these unfriendly perversions. A soldier received a flesh-wound, near Atlanta, Georgia, by a minnie-ball passing between the tendo-Achilles and the bones of the leg. The wound gave an unusual degree of pain, which evidently originated from injury to the saphenus nerve. On the tenth day after the injury, traumatic tetanus appeared in its most

violent form—every limb was stiff—the hands were clenched —the masseters held the inferior maxillary firmly against its fellow—the contractions were tonic. Chloroform was administered *more solito;* soon the contractions were clonic, and when he was fully under the influence of the drug every muscle relaxed. As the effect of the chloroform passed off, clonic contractions appeared; these were controlled by allowing him a few inhalations of the vapor at increasing intervals. Six hours afterwards, every nerve was performing its functions well, and the voluntary muscles were at rest. The recovery was complete and permanent, though the seat of local irritation, or *ipse morbus,* remained intact.

Gangrene.—The antidotal influence of bromine upon gangrene and other zymotic poisons is most efficient, and is perhaps the least known. The use of it in gangrene, in the Clay General Hospital, at Louisville, Ky., was attended with unvarying success. The solution was made with 1 oz. of bromine to 3 ozs. of water. Doubtless the reason iodine has failed, in some hands, to accomplish the same results, is because the solution was prepared too weak. In August, 1864, gangrene became rife among the wounded of Sherman's army at Marietta, Ga. Having had much to do with this fearful malady, I was directed to have all the patients affected with gangrene conveyed to an isolated apartment, and to direct their treatment, in addition to my duties as Surgeon in charge of the officers' department of the 17th Army Corps Hospital. A tent was accordingly pitched, in which about fifty cases were treated; of these many appeared to be hopeless.

It would be useless to weary the reader with a tedious iteration of special cases, as he is presumed to know that gangrene is a stage of mortification; that it is propagated by an infectious and inoculable animal poison, which may be introduced into the system through wounds or abrasions; that it declares its presence by local but rapidly progressive death of the tissues, and as the blood imbibes the virus it

tends to necremia. The treatment consisted of fresh air and beef tea *ad libitum*, whisky freely, and morphine as occasion required. *R.*—Tr. chlor. ferri, gtts. 30; aqua, oz. 3—*ft. mist. haust. ter die sumend.* To some of them sulph. quin. was administered. There was no bromine on hand; therefore, as iodine is nearly allied to it in chemical properties, it was used topically as a substitute. *R.*—Offic. tr. iod., ozs. 6; iod., grs. 40; iod. pot., grs. 20—*ft. mist. bis in dies applic.*

I am satisfied that both iodine and bromine, when applied locally, are taken into the blood by the veins and lymphatic vessels, and are potential agents against gangrene, erysipelas, and other zymotic poisons. That these substances, applied topically, act constitutionally by being absorbed into the blood, is evinced by the sudden abatement of the constitutional symptoms that follows their use. They may also destroy baccilli. The above is an outline of the treatment; of course, it varies with circumstances, as in all other forms of diseases. Of the fifty cases treated, the loss was *nil.*

Syphilis.—Since the days of Paracelsus, many theories with regard to syphilis have been announced, flourished for a time, and vanished. But one idea withstood this metamorphosis, viz.: that mercury is its specific; and it is of this I wish to speak. It is passing strange, that a delusion so mischievous could so long escape the lore and acumen of so many keen observers.

Who knows more of syphilis than that it is a specific animal poison, and that it contaminates the system through the blood? If it be insisted that it affects the system in a specific manner peculiar to itself, I answer so do its analogues, variola, hydrophobia and scarlatina.

Liebig picks up the similitude, and views their action as catalytic. He shows that the poison is soon destroyed when it produces acute fever, as in variola and scarlatina, because the anorexia diminishes chymification and the blood-letting process. This view is well sustained when we observe further that such animal poisons as may exist long in the

system without disturbing the digestive organs, do contaminate it, and lay the foundation for after troubles. Of such, are syphilis, yaws and hydrophobia. Further, we observe that in hot climates, where people consume most light vegetable food, syphilis is most mild.

Ricord's doctrine, that there are two venereal contagions, is antagonized by Rollett, Diday, and other eminent authorities. It is very evident that syphilis and gonorrhea are distinct venereal poisons. The varied phenomena presented by syphilis are sufficiently explained by habits of life, temperament, etc. Beyond all doubt its ravages are greater in systems that have been saturated with mercury, either after or prior to the inception of the virus. Yet these ravages are perpetuated, with effects as detrimental to the profession as injurious to the health of the patient. But there is reason to believe that the enlightened researches of progressive science will palsy the prestige of routine, and break the spell that pinions the profession to the antiquated, but fatal, dogma—"Mercury cures syphilis." This is traditional empiricism, not supported, but condemned by all that is known of the pathology of syphilis, and thrice condemned by clinical revelation. Specific animal poisons give rise to a large community of diseases, in each of which mercury is most positively contra-indicated. True, much damage was done in the darker ages by treating them with mercury; but what enlightened physician of this day would think of treating any of the long list of zymotic diseases with mercury? A single dose must sometimes be given to meet the urgent indication of some complication; but its use is never demanded, and but seldom justified, in any zymotic disease. Syphilis is no more exempt from the force of these truths than scarlatina. But the bad effects of mercury do not appear so early in syphilis as in the latter, because it is more chronic; the poison ferments slower, and does not so soon evince the presence of either the animal or mineral poison. It is deplorable that some-

body once said that mercury is a specific—that it is "good for syphilis."

The persistent routinist continues to torture his patients with ptyalism; not neutralizing the virus already in the system, but adding another, which alone, or in intensified concert with the first, increases the violence and danger of after troubles. It is well known that mercury produces disease so like syphilis, that it is not easy to make the differential diagnosis; and if the patient appears to, or does, recover—as they sometimes will, in spite of the mercury—the mercury gets the credit, and the error is perpetuated. But if mercuro-syphilitic troubles afterwards come, they are thought to be the horrid ravages of syphilis.

It is amusing to read the spirited debates in Medical Societies upon the subject. Some men of profound erudition yet advocate the old mercurial treatment for syphilis;—others of equal ability and a grade more independence of thought, and with the meekness of a Moses and the doubt of Didymus, venture to question the use of mercury in the phagedenic or soft chancre, but think it an indispensable *desideratum* in the indurated or Hunterian variety. Druitt discovers the delusion, but only advances to do the subject *quasi* justice—like the advocates of ptyalism in other forms of disease, who had been impelled to renounce it; but they were still for "*touching the gums*"—yet this is ptyalism—a pig is a hog! Such is the reluctance and *gradual* haste with which even able medical men adandon old errors to which they have become wedded. But they should divorce themselves if they would walk in the light of science—if they would successfully combat disease—if they would represent the friendly powers of the healing art.

General Treatment.—The treatment of syphilis is local or surgical; also, medical or constitutional. Every chancre should be cauterized as soon as it makes its appearance; so also should every sore of doubtful character. The earlier a chancre is cauterized, *cæteris paribus*, the less liable the

system to constitutional contamination. Cauterization with nitric acid is most effective, and should be resorted to before the chancre is a day old. Iodoform dressings; iod. pot. in 30 gr. doses, three times a day; mild diet, frequent baths, and strict cleanliness. In the secondary and tertiary stages, the following: *R.*—Comp. syr. stilling., 4 ounces; tr. iod., 2 drachms. Mix. Sig. 1 drachm ter. dies.

The strict observance of hygienic measures is highly important. A medium temperature should be strictly maintained —the dress should be well adapted to the season —the bowels well regulated; constipation and drastic purgatives shoud be alike avoided. Frequent bathing is of special service; the baths should be tepid, and saturated with chloride of sodium. In the primary stage, rest should be enjoined.

According to Prof. Bennett, more than eighty thousand cases of syphilis have been submitted to experiment, which establishes beyond all doubt that the mild treatment as above directed leads to a quicker and more permanent cure than the mercurial treatment.

CHAPTER XI.

SEMEIOLOGY AND DIAGNOSIS—PROGNOSIS.

Semeiology is that branch of pathology which treats of the symptoms or signs of disease. Symptoms are derangements of the functions of any organ or part of the organism. They are the beacon lights which direct our investigations of the state of the system, and the signals upon which correct diagnoses and rational therapeutics proceed.

Some discrimination has been made between a symptom and a sign of disease. Symptoms are vital signs, and are indicative of functional derangement of an organ or part, as pain, nausea and spasm. Signs proper are such evidences as indicate more definitely to our senses structural change, or the physical condition or properties of an organ or part, as exemplified by position, bulk, weight, shape, color, etc. These evidences are usually elicited by sight, palpation, auscultation and percussion. Then, according to this classification, symptoms are subordinate auxiliaries to signs. A symptom is often common to various states of the system, and is therefore void of any definite signification. But when, in any case, the corroborative language of the symptoms calls attention directly to the suffering organ, and also affords a definite clue to the character of the lesion, they have collectively been called a sign.

An individual suffers with pain in the precordial region with epistaxis, or occasional hemorrhage from the lungs, and dropsical effusions in the chest and lower extremities. These would be mere symptoms to one, while to a more skillful observer they would be a sign of obstruction in the

valves of the heart. An icterode hue of the skin is itself a sign of existing hepatic derangement, in consequence of which a portion of bile has got into the blood. Skill in interrogating all the organs of the system, and in eliciting and properly appreciating the symptoms which mark their changes, is the great *sine qua non* upon which depends accuracy of diagnosis, prognosis and treatment of disease; and it is the highest accomplishment a physician can possess, and doubtless the most learned eminence that mortal man can attain.

Often a single symptom, or combination of symptoms, reveals correctly the diagnosis, prognosis and the indications of treatment. This is mainly true of the symptoms presented by disease in its advanced stage, as exemplified by typhus, phthisis and diabetes. But the physician is often called upon to diagnose, prognose and treat, the various forms of disease in their incipiency, when they present no definite or well developed symptoms, nor indications. Here it is that the physician exercises the finest discrimination in considering the relative dependence of all the implicated organs, and in receiving their conflicting testimony as that of so many contradictory witnesses.

In such cases accuracy can only be attained by faithfully investigating all the symptoms, one of which may specially aid the diagnosis, another may indicate the prognosis, and still another may point to the indications.

Difficult as the task may be, we should never be content with pushing our investigations only so far as to locate the lesion in some organ; but having definitely ascertained the location of the lesion, we should strive to determine its character, and the stage to which it has advanced, and the complications, if any, with which it is associated. Upon these latter points especially depend a reliable prognosis, and a successful treatment.

The quack, void alike of learning and conscience, goes bravely through the "quiz" of his patients and their inter-

ested but too-confiding friends, upon an erroneous, or, at the best, very indefinite diagnosis. Thus, we often hear practitioners who are riding the medical profession to the detriment of the character which wise men have given it, remark, with much assumed wisdom and gravity of manner, "The patient has disease of the heart, disease of the lungs, or disease of the womb;" and this is often satisfactory to his unsuspecting patrons; but if some solicitous friend is thoughtful enough to ask him what *kind* of a disease, and whereabouts in the organ it is situated, he would give it a name, location and character to satisfy inquiry till he collects his fee and gets out of sight, or, at least, to shield his ignorance till a physician comes to expose it.

Scarcely less reprehensible are those adventurers in the practice of medicine, who admit their unpardonable defects, and strive to saddle them alike on the worthy members of the profession. Thus, they will say, "Doctors don't understand the diseases of children." "We can't tell what ails a child." Now, if they cannot tell what is the matter with a child because they can elicit no word of complaint from it, why do they visit adults when they are insensible or speechless? It is but justice to medical men to say that they do not share such ignorance. It is often difficult to diagnose disease in an infant, but it is seldom beyond the ken of the physician who is guided by sound reason and the light of pathology.

Correct diagnosis points out the proper indications, and is suggestive of proper measures to meet them, in each individual case, and is therefore an indispensable requisite to a rational practice. In order to form such diagnosis, the physician, when he approaches the bed-side, should be able to call into requisition a thorough knowledge of anatomy, physiology and pathology, and this essential duty is to be performed before he administers a single dose of medicine—before he knows what indications are presenting, and certainly before he knows what medicines or appliances are

demanded, or from what kingdom of nature they are to be derived. Then how fallacious the doctrines and how absurd the claims of those who found their low creeds upon the use of medicines derived from a certain kingdom of nature, or subjected to a process of trituration, with the absurd idea of potentializing, while they are almost in total ignorance of the structure of the human system, of its various changes and conditions, which suggest the varied uses of medicine; and, necessarily, alike ignorant of the physiological action and thereapeutic properties both of the medicines which they administer and of those which they condemn.

Examination of the Patient.—The physician should approach his patients in an agreeable mood, and manifest to them a due degree of sympathy and respect. He should feel free to ask all questions necessary to a thorough examination of the case, but should by no means intrude upon the patient a long series of irrelevant questions, calculated to weary their patience, or shock their modesty, for the sole purpose of appearing extremely wise. Neither should he sit patiently to hear a detailed narration of all the frivolous incidents that have occurred during the last ten years of the patient's life. The statements of the patient often aid materially in forming a diagnosis, but sometimes they are to be taken with a great deal of allowance. The questions should be in comprehensive language, and such as are suggested by the symptoms or by previously ascertained facts. I need scarcely remark that it is very gross and non-professional for a physician to begin the examination of a case by asking the patient what is the matter.

It is well, after addressing the patient pleasantly, to direct questions in this manner: "How long have you been sick? Are you suffering a great deal?" and so on with such other important questions as may present themselves. I am accustomed to diagnose by exclusion; that is by commencing at some organ, say at the brain, and examining every organ cursorily or minutely as circumstances may require

and then exclude from special attention such organs as are found to be healthy. Proceeding in this manner, examinations are most conveniently and satisfactorily performed.

Thus we interrogate the functions of the brain: Is the intellect bright, obtuse or annihilated? These latter phenomena are inevitable consequences of congestion of that organ, and if, in addition to impaired intellect, we find the head hot and the extremities cold, the evidences are conclusive. But the intellectual faculties are often deranged by foreign poisons circulating in the blood, or in consequence of insufficient stimulus imparted by that fluid to the brain, as in the low grades of continued fever. Ringing in the ears like the jingle of a bell, the rush of wind, or the roar of a cataract—*tinnitus aurium*—is a symptom which sometimes arises from very trivial causes, but it often indicates softening of the brain or of its meninges. The hearing may be obtuse in consequence of the accumulation of cerate in the auditory canal, of enlargement of the tonsils, which produces occlusion of the eustachian tubes, or of some of the various lesions, or influences which render the auditory nerves incapable of receiving the impression produced by the vibrations of air. On the other hand, the auditory nerves may be remarkably sensitive to these impressions when the hearing is correspondingly acute. Either obtuseness or acuteness of the function of audition may be present during the course of continued fever; of these, acuteness is always the more grave symptom.

The appearance of the face is often a good index to the character of disease. The blanched cheek and the pallid lips at least indicate anemia. The corrugated brow indicates agonizing pain, which is generally situated in the abdominal region.

The *eye*, when dull and heavy, indicates languor; when the minute branches of veins which ramify the cornea are red and distended with blood, it indicates cerebral conges-

tion, when there is not inflammation of the eye; when glazed and sunken, it indicates approaching dissolution.

The *nose*, when it presents a peculiar sharp appearance, indicates excruciating pain; when the anterior nares are expanded, it indicates difficulty of breathing; when the nasal bones are destroyed, so as to let the nose flat down on the face, it tells of the ravages of syphilis, especially if there is no external cicatrix.

The *mouth*, too, is expressive. Thick and pendent lips are expressive of nausea, and of dull pain; when the lips appear thin and compressed, it is expressive of lancinating pain.

The *tongue* reveals many secrets. When covered with a thick coat of yellowish or brownish fur, it indicates torpidity of the liver; a similar coat, with red tip and edges, indicates inflammation or irritation of the large intestines. As seen in dysentery, sordes on the tongue and lips indicates contamination of the blood, and much debility. A coat of white fur on the tongue indicates inflammation of serous or of fibrinous tissue, as seen in rheumatism and in inflammation of the membranes of the brain; it also often indicates the presence of worms in the intestines.

It should however be remembered, in this connection, that it is common for an infant to have a white tongue. A tongue covered with a white fur, through which project numerous red papillæ, is indicative of some of the zymotic fevers, and especially of scarlatina and measles. A sharp, red tongue indicates inflammation or irritation of mucous membranes. A tongue which is dry, parched and fissured, characterizes the low grades of fever.

Dysphagia, or difficulty of swallowing, is a symptom common to most of the anginose affections, and especially those involving the uvula and tonsils. Dyspnœa, or difficulty of breathing, is indicative of various lesions of the respiratory apparatus, as inflammation of the larynx, trachea, or the lungs, and it is usually a distressing symptom in asthma,

phthisis, and emphysema. Difficult breathing also attends any obstruction of the valves of the left side of the heart, capable of retarding the flow of blood from the lungs. This symptom also attends when any fluid has collected in the pleural cavity. The accumulated fluid which thus encumbers the lungs may be water (*hydrothorax*), or pus (*empyema*).

Cough is produced by any of those conditions just mentioned as giving rise to dyspnœa, also by some morbid states of the liver, in which its vicarious relation to the lungs is interrupted; and a very peculiar cough often attends hysteria.

Auscultation and percussion furnish many valuable physical signs which materially aid in diagnosing diseases of the heart and lungs. Physical exploration of the chest presents a vast field for profitable research and practical reform, but too much of detail for the design and scope of this work.

It may suffice to say here that a healthy lung yields a resonant sound on percussion. Undue resonance indicates emphysema, or pneumothorax. Undue resonance of the voice in any region of the chest indicates that the lung contains a hard mass of tubercles, or is rendered dense by inflammation, so as to conduct the murmur of the voice from the bronchi directly to the ear of the listener; this sound is called *bronchophony*. Dullness on percussion indicates that the air is partially or entirely excluded from the region of the lung by a tubercular mass, or by exudation of lymph, as in hepatization resulting from inflammation. The crepitant râle is heard in the incipient, and again in the declining stage of pneumonia.

The *pulse* is a most instructive guide to diagnosis, prognosis, and the indications of treatment. An irregular pulse shows a want of balance in the circulation, and with other corroborative symptoms it is symptomatic of organic lesion of the heart. A small, feeble, and depressed pulse denotes congestion, as illustrated during the ague chill, and in the rigor which ushers in inflammation of the lungs. A feeble

pulse attends anemia and general debility. A strong pulse attends the higher grades of fever, and inflammation of certain organs, as the lungs, and it is a constant symptom of hypertrophy of the left ventricle of the heart. A frequent pulse attends most febrile affections; when small and frequent, it often indicates inflammation of some of the abdominal viscera; when frequent, small, and thread-like, so that the pulsations of the artery can but with difficulty be felt, it indicates extreme prostration of the vital powers, as in the sinking which precedes death.

The pulse is full and resisting in pneumonia; small, soft, and frequent, generally, in typhoid fever; full, strong, and frequent, usually, in remittent fever; strong and frequent in inflammation of the brain or its membranes; small and frequent in inflammation of the kidneys, womb, or peritoneum. The pulse is slow during the passage of a gall-stone through the ducts leading from the liver to the intestine. It is frequent and appears to pass quickly from under the finger in phthisis. This last statement is well exemplified by the fact that consumptive patients, even while they are able to follow their daily avocations, usually have a pulse beating 90 or 100 times each minute.

Tumors and fluids contained within the ventral cavity are diagnosed mainly on physical principles, as by palpation, percussion, and succussion, and these measures are generally rendered more efficient by the aid of commemorative circumstances.

Pain often furnishes reliable evidence of the seat and character of disease. It is a direct symptom when felt at the seat of lesion, but is an indirect symptom when referred to a remote part; thus the pain attending inflammation at the hip-joint is first felt at the knee. Tenderness is nearly allied to pain, but is more indicative of inflammation, except in hysterical females, in whom both these symptoms may be present in a part without any lesion whatever. Tenderness is often the most reliable evidence that can possibly be

attained of inflamation situated in internal organs. Thus, when the womb is inflamed, if the patient flex the legs, as in drawing up the feet, the psoas muscles contract and impinge upon the tender organ, thus giving rise to severe pain.

Prognosis is the judgment of the physician regarding the course and termination of any disease, and, in literal strictness, it implies a knowledge of the location, grade, degree and character of the disease of which the prognosis is formed. This knowledge is derived from a thorough acquaintance with the essential characters of disease, and with the import of the various symptoms or phenomena which indicate its presence, and also its mildness or its severity. As examples of important prognostic symptoms are, the clearing of the fur from the tongue, and the return of the appetite, which are favorable indications in most all affections. Sudden and voracious craving for food, when severe symptoms exist without abatement, is usually ominous of evil. In pneumonia, the return of the crepitant râle, and of resonance on percussion over the inflamed region of lung, are favorable. In cerebrites, when the ravings of the patient subside in profound coma, the prognosis is decidedly unfavorable. In the essential fevers, the more regular the pulse, and the nearer it approaches the normal standard in frequency, the more favorable the prognosis.

CHAPTER XII.

GENERAL THERAPEUTICS.

Therapeutics is that branch of General Pathology which pertains to the action and use of drugs, curative agencies, and healthful influences; and has for its object the prevention, amelioration and cure, of disease. The various departments of medical science are essential and mutual auxiliaries in the attainment of this desirable object. Thus, a comprehensive knowledge of Anatomy, Physiology, Etiology, and the essential elements of disease, is indispensable to a correct diagnosis. This, when aided by the instructive revelations of Chemistry, a correct knowledge of the physiological action of drugs, and by a proper appreciation of the varied influences upon the organism of such ingesta as air, food and drinks, and of such external physical relations as climate, dress and exercise, is suggestive of healthful and curative measures.

Such measures as are resorted to for the purpose of maintaining the system at a standard of health come within the range of Hygiene, or that department of Medicine which treats of the preservation of health. Of such measures, are cleanlinesss of the person, the breathing of pure air and the judicious regulation of all the habits, as exercise, eating, drinking and sleeping. These essential measures are of the utmost importance to invalids.

Food should be taken at regular periods, in sufficient but not inordinate quantities. It should be nutritious, easily digested, well cooked, well masticated, and eaten without

great haste. It is most healthful if taken when it is cold or cool, and when the mind is cheerful or in a jocund mood. The adage is true that we "laugh and grow fat."

Bread, as made at the present day, containing largely of soda as a condiment, without a sufficiency of acid to neutralize it, is too strongly alkaline for the digestive apparatus, and is wholly unfit for food.

In many forms of disease, food may be selected containing the most decided therapeutic properties, as exemplified in the curative effect of potatoes in scurvy; and in cod-liver oil, and a nutritious diet composed of fresh milk and the flesh of animals, in phthisis. On the other hand, dyspeptic patients suffer under an animal diet, and especially from partaking of rich soups: so that what is food, or even remedial to one, is poison to another.

Drinks.—Cold water, as a drink in febrile affections, acts as a useful therapeutic agent by lowering the temperature of the body and diluting the blood, thus facilitating the excretion of *materies morbi* through the emunctories. Strong coffee and tea are stimulants to the nervous centers, and the former is a most efficient therapeutic agent in poisoning by opium. Pure alcoholic spirits are diffusive stimulants; they act temporarily as tonics, bracing the system against suspension of the physical energies and the approach of collapse, and are therefore the most efficient and reliable agents in all conditions of extreme prostration, whether the result of continued fever or of an exhaustive hemorrhagia.

We shall now proceed to notice some of the therapeutic agencies and drugs proper which have been used as curative measures. The uses of, and properties ascribed to, many of these agents and drugs, by works on *Materia Medica*, are merely traditional. Many fallacies respecting their therapeutic action gain credence from the statements of mere compilers, and are perpetuated by the circumstance that diseases which tend to recovery often subside after such supposed remedies have been administered; and this is

taken as conclusive evidence of their remedial agency, when in fact their action has in no way produced, but has even tended to prevent, the desired result.

To illustrate; take, for example, the treatment of pneumonia by blood-letting, antimony and mercury to the extent of ptyalism, as taught and practised in days of yore. Ever since medicine has been regarded as a science, until after the middle of this century, these were acknowledged by the profession, and sanctioned by the great names of Galen, Cullen, Andral, and even the profound Linton, as remedies *par excellence.* To such practice I have during my professional life dissented, for the reason set forth in the following letter, written by me thirty-one years ago, to Prof. M. L. Linton, of St. Louis, and published by him in the Medical and Surgical Journal:

HOLDEN, JOHNSTON COUNTY, MO.,
January 23, 1860.

PROF. M. L. LINTON, M. D.

Dear Sir: You will recollect the following query which you found in an anonymous note on the stand in your Lecture room, during the Session of 1857–8, to-wit: "If pneumonia is induced by a superabundance of arterial blood in the lungs which causes a deposit of fibrin and albumen in them; and if this deposit acts as an irritant, inviting an increased flow of blood to the part; and if this congestion, interfering with the normal action of the lungs, induce venosity of the blood; and if venosity be a potent auxiliary in the spontaneous cure of pneumonia, would you bleed in pneumonia; and if so, why?"

If each condition in the above interrogatory is a truism—and you will agree that it is—then bleeding is a deplorable agent in *most* cases of pneumonia. So I thought then, and do yet think. I am the author of the anonymous note referred to; and of course very respectfully and inquir-

ingly submitted it to you. In justice to myself, I must say that I did not write nor present but the one written question to you.

However, I suggested the following question, which was submitted to you by Mr. Jos. H. Carter, to-wit: *"In what form of disease is ptyalism a remedy?"*

In view of the established fact that in persons who are "salivated," the serum of the blood is increased, the fibrin and albumen diminished, also the crassamentum, and the whole circulating current loaded with a fetid fatty matter, I did then, and do now believe, that ptyalism is not a remedy in any, but a potent evil in every form of disease. I know it is said ptyalism is an evidence that the medicine is "taking effect." But I regard it as an incipient dissolution of the vital tissue; the condition of the blood being as above described, it is a lesion of structure depending upon one of *your* "qualitative changes of the blood." *Quid tibi videtur?*

* * * * * *

I would take blood from a vein, in pneumonia, but seldom. I would salivate never.

Yours, as ever,

CHAS. L. CARTER.

"[It will be perceived that the above letter was not written for publication, but I have thought it worthy of a place in the Journal. The author's reasoning is good against bleeding in pneumonia, as a remedy exclusively relied on. Nevertheless, as the quantity of blood is as well to be considered as its quality, in persons of the sanguine temperament bleeding is beneficial in the first stage of pneumonia. In many cases I do not bleed, and for the reasons which Dr. Carter has stated. That mercurials are beneficial in inflammatory affections, is an established fact in therapeutics. The *salivation itself* does no good that I know of. Indeed it often does a great deal of harm; but we often have to risk

this harm for the benefits the remedy effects. I never wish to salivate; and when the gums show that the remedy is taking effect, I consider it as pushed far enough. In conclusion, I should be pleased to hear again from Dr. Carter on such subjects. L.]"

The above comments by Dr. Linton contain a degree of concession to the principles advocated by me, and exhibit at least a partial abandonment of the principles which are supposed to justify such practice. Though salivation is in all cases to be avoided as useless and detrimental, yet mercury, when judiciously administered either in the form of calomel or mass pill, is a valuable therapeutic agent in some hepatic, affections. It should in no case be administered in large portions, nor in small and frequently repeated doses. It should not be prescribed when only a cathartic action is desired, nor administered blindly under the traditional delusion that it is a Samson in all severe or obscure diseases. It should be used with great care, if at all, in persons who have been salivated, and in those of a strumous diathesis or a syphilitic cachexia.

The chief therapeutic properties of mercury depend upon its action in diminishing the process of oxydation and in exciting the functional activity of the liver. When used for either of these purposes (for the former its use is now about obsolete), it should be administered in a dose of from two to five or ten grains, combined with, or followed in six or eight hours by, some mild purgative, to insure its action on the bowels; or, in bilious conditions attended with diarrhœa, it may be combined with a portion of opium. Taken in combination with flour of sulphur, it will scarcely, if at all, salivate. Quite recently, the capability of mercury to promote the functional activity of the liver has been doubted by respectable authority, but the assumption is in conflict with pretty well authenticated facts which should forbid that it receive the credence of the profession.

Venesection was long practised under very erroneous ideas, and with very fatal consequences, as in pneumonia, accidental injuries, and even in hemorrhage itself, and in the low grades of fever. Such practice certainly would not be approbated by any enlightened practitioner of the present day.

Counter-irritation is an efficient curative measure against inflammation, especially in the sub-acute and chronic stages. Counter-irritants act as revulsives, and should be applied immediately over any inflamed internal organ, except the eye or the brain, when the irritation produced should be at the back of the neck, or on the extremities. The therapeutic value of counter-irritants, is well shown by the ameliorating and curative effects of sinapisms to the chest in pleuritis and pleurodynia, of fly-blisters of the back of the neck and at the extremeties in cerebral congestion, or to the chest in pneumonia, or of a seton in the back of the neck in various forms of ophthalmia.

Purgatives are of essential service in cerebritis, infantile convulsions, and in that peculiar endemic affection known as milk sickness; but they should be avoided, or used with caution, in diseases having a decided tendency to prostration. Sudorifics and diuretics are useful agents in the treatment of diseases consisting in qualitative changes in the blood, as the essential fevers.

Anodynes and hypnotics are valuable therapeutic agents in many forms of disease, by virtue of their properties of allaying pain and promoting sleep. In all diseases attended with anemia, and general debility, tonics, as iron, the vegetable bitters, and mineral acids, are eminently curative. The sulphate of quinine is almost a specific in the treatment of ague; as are iodine in scrofula, and iodide of potassium in syphilis. The curative effect of iodine in scrofula, though doubted by Prof. Bennett, is a fact well established in therapeutics.

Respecting the physiological action and therapeutic properties of medicines, much discrepancy of opinion exists.

This contrariety of professional opinion has led to two unwarrantable extremes. One is strangely incredulous of the curative properties of all drugs and therapeutic agents, and the other ascribes to them the fabulous powers of enchantment, and looks to them as the prime motors of progressive medicine. These are but the embodiments of skepticism and humbuggery.

Every species of humbug is called progression, and such delusions are common in medicine, in politics, and in religion. I do not claim for the medical sciences exactitude, but progression. If their mystic but instructive teachings are difficult of comprehension, the best minds are engaged in their solution.

The great barrier to science is, that some observers are too theoretical; others are careless as to theory, but blindly follow the practical detail of some antiquated adage or exploded dogma, indeed excelling the monkey in imitative genius. If they exhibit any signs of life, it is in promulgating the errors of the last generation with a zeal which would accomplish anything but promote science or make error useful.

I assert my belief that the practice of medicine as sanctioned by American and European schools, is too anti-phlogistic. If ptyalism, active blood-letting, antimonialization, veratrum, and the withholding of a moderate amount of nutritive food from bed-ridden patients, are justified by an established fact in pathology, I have not the erudition to perceive it. I was initiated into the profession proclaiming a firm resistance to the anti-phlogistic regimen. Thirty-six years' extensive practice, civil and military, has well confirmed the correctness of the principles which guide me, and justifies me in saying to the profession, and especially to those who are novices in professional life, be careful to avoid active depletion, but sustain the physical powers, and foster the energies of life by every means not positively contra-indicated. Charlatans often get advantage, by doing nothing, over anti-phlogistic doctors, who often do absolute

harm. This exposes the profession to ridicule, and makes skeptics of the people, who are justly entitled to act as umpires.

It is an error fatal to the advancement of the sciences upon which the healing art depends, that medical men have too much neglected physiological investigation and diligent research into the elements of disease, which are the surest guides to rational thereaputics, and have looked for new remedies, or to the traditional properties of drugs for the advancement of the profession they desired to honor. But as the light of science guides us onward, it becomes more apparent that such delusive phantom is but the power which drives the car of empiricism, and that an advanced pathology is the true *vis a tergo* of enlightened therapeutics.

[FINIS.]

LIBRARY OF CONGRESS
0 007 722 260 1